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SELECTED WATER RESOURCES ABSTRACTS

VOLUME 6, NUMBER 9
MAY 1, 1973

W73-05201 -- W73-05850

U.S. DEPARTMENT OF THE INTERIOR
OFFICE OF WATER RESOURCES RESEARCH
WATER RESOURCES SCIENTIFIC INFORMATION CENTER



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SELECTED
WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center, Office of Water Resources Research, U.S. Department of the Interior



VOLUME 6, NUMBER 9
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The Secretary of the U. S. Department of the Interior has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1973.

As the Nation's principal conservation agency, the Department of the Interior has basic responsibilities for water, fish, wildlife, mineral, land, park, and recreational resources. Indian and Territorial affairs are other major concerns of America's "Department of Natural Resources."

The Department works to assure the wisest choice in managing all our resources so each will make its full contribution to a better United States—now and in the future.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into ten fields and sixty groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the BioScience Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Resources Research and other Federal water resources agencies with which the

Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Resources Research
U.S. Department of the Interior
Washington, D. C. 20240

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01 NATURE OF WATER
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02 WATER CYCLE
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03 WATER SUPPLY AUGMENTATION AND CONSERVATION
Includes the following Groups: Saline Water Conversion; Water Yield Improvement; Use of Water of Impaired Quality; Conservation in Domestic and Municipal Use; Conservation in Industry; Conservation in Agriculture.

04 WATER QUANTITY MANAGEMENT AND CONTROL
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06 WATER RESOURCES PLANNING
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ABSTRACT SOURCES

SELECTED WATER RESOURCES ABSTRACTS

02. WATER CYCLE

2A. General

GEOMORPHIC REGIMEN OF SMALL WATERSHEDS IN LOESS, TAMA COUNTY, IOWA,
Iowa State Univ., Ames. Dept. of Agronomy.
W. J. Vreeken.
Ph D Thesis, 1972. 317 p, 43 fig, 63 tab, 56 ref. OWRR A-014-IA (3).

Descriptors: *Geomorphology, *Small watersheds, *Loess, *Iowa, *Hydrogeology, Sedimentation, Stratification, Alluvium, Hydrologic data, Data collections, Topography, Geology, Aquifers, Groundwater movement, Sedimentology, Particle size, Water table, Soil profiles, Water quality.
Identifiers: *Tama County (Iowa).

Various aspects of the geomorphic regiment in two fingertip watersheds were studied in the loess-mantled Iowan Region of northeast Iowa. Stratigraphic, paleogeomorphic, chronologic, sedimentary, hydrologic, and pedologic relationships were investigated in successive order. This interdisciplinary approach was used in order to unravel the developmental history of the watersheds and to assess the present geomorphic framework. The two research areas, the Thoms and the Soucek watershed, are situated on the southern flank of the northern divide of the Four Mile Creek basin, Tama County. The physical properties of surface materials of the loess-mantled landscape favor perching of groundwater within the loess. The thick loess that occurs along thebroad divides of the Four Mile Creek basin serves as an aquifer that sustains baseflow during prolonged drought. Approximately 30 days are needed by infiltration water to travel along the loess-mantled drainage network before it reaches the basin trunk stream. (Woodard-USGS)
W73-05328

DEVELOPMENT OF A STATE WATER-PLANNING MODEL, PART III: PERIPHERAL MODELS OF SUB-BASIN 43-Q OF THE YELLOWSTONE BASIN,
Montana State Univ., Bozeman. Water Resources Research Center.
For primary bibliographic entry see Field 06A.
W73-05578

DROUGHTS AS EXTREME DISTRIBUTIONS FROM A POINT RAINFALL PROCESS,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
V. K. Gupta, C. C. Kisiel, and L. Duckstein.
January 1973, 11p, 3 fig, 1 tab, 10 ref. OWRR-A-032-Ariz (2).

Descriptors: *Statistical models, *Droughts, *Hydrologic data, Methodology, *Frequency analysis, *Stochastic processes, *Synthetic hydrology, *Depth-area-duration analysis, *Time series analysis, Arid lands, Seasonal, Planning, Model studies, Probability, Statistical methods, *Arizona, Regional analysis, Distribution patterns, Probable maximum precipitation, Duration curves.
Identifiers: Poisson process.

Based on a random number of random variables, an attempt is made to model 'critical' drought durations at a point in some given time interval from extreme value considerations. Specifically, two aspects associated with extreme durations of droughts are examined: (1) the maximum drought duration (dry period) that may be expected within a given time interval (e.g., a crop season), and (2) the length of time necessary to wait to experience a drought that exceeds a preassigned 'critical' duration. This approach has the following characteristics: (a) little data requirements for validation, (b) spatial transferability of information derived at some fixed point, and (c) potential for its extension to durations of areal droughts within a given time interval. The selection of datum would be governed by the water demand factors of different water usages. The distribution of number of events within a season is assumed to follow a homogeneous Poisson process, which has been observed to be valid by various researchers in the past. Based on the Poisson assumption, the distribution functions of the two random variables, namely, the maximum dry period within a season, and the waiting time to experience the first critical dry period, are given. The statistical moments for both cases can be computed. The theoretical results are tested using point rainfall data from Tucson, Arizona. Extensions of this approach to spatial drought conditions are presently under investigation, by considering simultaneously a finite number of rainfall processes distributed within the area of interest. (Black-Arizona)
W73-05777

2B. Precipitation

BOMEX ATLAS OF SATELLITE CLOUD PHOTOGRAPHS.
National Oceanic and Atmospheric Administration, Rockville, Md. The BOMAP Office.
For primary bibliographic entry see Field 07B.
W73-05337

BOMEX FIELD OBSERVATIONS AND BASIC DATA INVENTORY.
National Oceanic and Atmospheric Administration, Rockville, Md. The BOMAP Office.
For primary bibliographic entry see Field 07C.
W73-05338

HYDROLOGICAL STATISTICS,
Ministry of Works, Wellington (New Zealand). Water and Soil Div.
For primary bibliographic entry see Field 07C.
W73-05699

MANIFESTATION OF ATMOSPHERIC CYCLES IN ICE COVERAGE (K OSOBENNOSTYAM PROYAVLENIYA ATMOSFERNYKH TSIKLOV V LEDOVITOSTI),
Arkticheskii i Antarkticheskii Nauchno-Issledovatelskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 02C.
W73-05706

DROUGHTS AS EXTREME DISTRIBUTIONS FROM A POINT RAINFALL PROCESS,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 02A.
W73-05777

CLOUD SEEDING INTERPRETED THROUGH ATMOSPHERIC WATER BALANCE,
Colorado State Univ., Fort Collins. Dept. of Atmospheric Science.
For primary bibliographic entry see Field 03B.
W73-05793

WATER VAPOR: STRATOSPHERIC INJECTION BY THUNDERSTORMS,
National Oceanic and Atmospheric Administration, Boulder, Colo. Environmental Research Labs.
P. M. Kuhn, M. S. Lojko, and E. V. Petersen.
Science, Vol 174, No 4016, p 1319-1321, December 24, 1971. 1 fig, 6 ref.

Descriptors: *Water vapor, *Thunderstorms, *Central U.S., *Atmosphere, *Data collections, Measurement, Aircraft, Radiosondes, Telemetry, Meteorology, Instrumentation, Infrared radiation, Analytical techniques, Clouds.
Identifiers: Stratospheric injection.

High-altitude infrared measurements of the total mass of water vapor above flight level in the vicinity of thunderstorms, at and just below the base of the stratosphere, were made in July 1971 over the Central Plains. Observations revealed that the vertical drive of these huge storm cells resulted in the local injection of large amounts of water vapor into the atmosphere. The National Aeronautics and Space Administration (NASA) Ames Research Center's Convair 990 (CV-990) jet laboratory provided the long-range, high-speed, and high-altitude capability required in this study. In situ measurements of the temperature and the concentration of solid particles indicate that the CV-990 was just at the base of the stratosphere. The observations spanned the life cycle of the cell system. In the three circumferential flight tracks, the mass of water vapor (in grams per square centimeter) above the flight level was considerably larger, as far as 20 km downstream of the cell, than upstream. Within the resolution accuracy of the radiometric inference system, at 45 km downstream the water vapor was again equivalent to the upstream mass at the end of the first traverse. (Woodard-USGS)
W73-05799

2C. Snow, Ice, and Frost

FILLED INTERGLACIAL VALLEYS AT THE SOUTH END OF CAYUGA LAKE NEAR ITHACA, NEW YORK,
Cornell Univ., Ithaca, N.Y. Water Resources and Marine Sciences Center.
A. L. Bloom.
Available from the National Technical Information Service as PB-214 770, $3.00 in paper copy, $0.95 in microfiche. Water Resources and Marine Sciences Center Technical Report No. 52, 1972. 20 p, 3 fig, 1 tab. OWRR A-031-NY (1). 14-31-0001-3232.

Descriptors: *Glaciation, *Glacial aquifers, *Glacial drift, Glacial sediments, *New York, Geomorphology, Pleistocene epoch, *Alluvium.
Identifiers: Finger Lakes (New York), *Cayuga Lake (New York).

Preliminary maps were compiled to show the distribution of alluvial fills in valleys tributary to the southern third of Cayuga Lake. Most of the valleys are bedrock gorges. No new discoveries were made of valleys buried or filled by alluvium or glacial drift. The results of the project, with discoveries made before and after the funding period, were incorporated in a guidebook for a geological field conference held in Ithaca on May 19-21, 1972.
W73-05204

INFLUENCE OF GROUNDING ICE ON THE ARCTIC SHELF OF ALASKA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 02J.
W73-05311

ANALYSIS AND INTERPRETATION OF AIR-BORNE MULTIFREQUENCY SIDE-LOOKING RADAR SEA ICE IMAGERY,
Naval Oceanographic Office, Washington, D.C. Polar Oceanography Div.
For primary bibliographic entry see Field 07B.
W73-05678

SINUOSITY OF SUPRAGLACIAL STREAMS,
Hull Univ. (England). Dept. of Geography.

For primary bibliographic entry see Field 02E.
W73-05680

INVESTIGATION OF ICE CONDITIONS IN ARCTIC SEAS AND METHODS OF FORECASTING AND COMPUTATION (ISSLEDOVANIYE LEDOVOGO REZHIMA ARKTICHESKIKH MOREY I METODY PROGNOZOV I RASCHETOV).
Arkicheskii i Antarkticheskii Nauchno-Issledovatelskii Institut, Leningrad (USSR).

Arkticheskiy i Antarkticheskiy Nauchno-Issledovatel'skiy Institut Trudy, No 303, N. A. Volkov, editor, Leningrad, 1971. 212 p.

Descriptors: *Arctic, *Ice, *Sea ice, *Ice cover, *Movement, Waves (Water), Currents (Water), Tides, Winds, Snow, Meteorology, Hydrodynamics, Properties, Compaction, Stress, Mathematical studies, Model studies, Forecasting, Computers, Equations.
Identifiers: *USSR, *Ice drift, *Ice drifting stations, *Ice floes, Wind drift, Tidal currents, Tide cycles.

This collection of 20 papers covers a wide range of topics related to ice conditions in arctic seas, including ice coverage and its variability, ice drift, and growth and decay of ice cover. The titles of individual papers are: (1) cyclic fluctuations of ice coverage in arctic seas; (2) testing a numerical model of spring-summer redistribution of sea ice; (3) methods of forecasting long-term variations in ice coverage of the Greenland Sea; (4) manifestation of atmospheric cycles in ice coverage; (5) application of discriminant analysis to long-range ice forecasting for actic seas; (6) effect of long-period tides on ice conditions in arctic seas; (7) results of the study of nonuniform ice drift in the Arctic basin; (8) excitation of compressive stresses in ice during the hydrodynamic stage of compact ice drift; (9) effect of long-period tides on ice drift in the Arctic basin; (10) ice drift in an inhomogeneous pressure field; (11) wave drift of an isolated floe; (12) seasonal characteristics of the 'pole tide' pressure wave over the Arctic; (13) relation of the resultant monthly average wind to the pressure gradient; (14) experimental determination of wind drag on an ice sheet; (15) statistical characteristics of some ice-cover parameters in the Arctic; (16) estimating the lateral melting of drift ice; (17) snow accumulation on ice of the Kara Sea; (18) measurements of shear deformation of a natural ice field with optical theodolites; (19) observations of ice motion with optical theodolites on on the Severnyy polyus-17 (North Pole-17) drifting station; and (20) application of computers to determination of age characteristics of Arctic ice. (See W73-05703 thru W73-05718) (Josefson-USGS)
W73-05702

CYCLIC FLUCTUATIONS OF ICE COVERAGE IN ARCTIC SEAS (O TSIKLICHNOSTI V KOLEBANIYAKH LEDOVITOSTI ARKTICHESKIKH MOREY),
Arkticheskii i Antarkticheskii Nauchno-Issledovatelskii Institut, Leningrad (USSR).
N. A. Volkov, and B. A. Sleptsov-Shevlevich.
In: Issledovaniye ledovogo rezhima arkticheskikh morey i metody prognozov i raschetov; Arkticheskiy i Antarkticheskiy Nauchno-Issledovatel'skiy Institut Trudy, No 303, p 5-35, Leningrad, 1971. 16 fig, 10 tab, 10 ref.

Descriptors: *Arctic, *Ice, *Ice cover, *Cycles, *Fluctuations, Variability, Distribution, Statistical methods, Correlation analysis, Probability, Forecasting, Analytical techniques, Meteorology, Climatology, Summer, Seasonal.
Identifiers: *USSR, Isopleths.

General features and factors responsible for spatial and temporal variability of summer ice coverage in 10 regions of the Arctic Ocean were investigated for developing techniques for long-range ice forecasting. Distribution of specific ice coverage in arctic seas depends largely on autumn and winter ice-growth processes, which in turn are determined by the climate and the system of air and sea currents. Nonuniformity of ice-coverage amplitudes is determined by anomalous hydrometeorological processes in individual years. Nonuniform distribution of ice-coverage norms in summer is determined mainly by the nonuniform spatial distribution of ice-cover thickness at the time of its maximum development. Regions with thickest ice cover in winter have the highest specific ice coverage in summer, and regions with thin ice cover at the beginning of the melt season show a low specific ice coverage in summer. (See also W73-05702) (Josefson-USGS)
W73-05703

TESTING A NUMERICAL MODEL OF SPRING-SUMMER REDISTRIBUTION OF SEA ICE (ISPYTANIYE CHISLENNOY MODELI VESENNE-LETNEGO PERERASPREDELENIYA MORSKOGO L'DA),
Arkticheskii i Antarkticheskii Nauchno-Issledovatelskii Institut, Leningrad (USSR).
Yu P. Doronin, N. A. Zhukovskaya, and A. V. Smetannikova.

Descriptors: *Arctic, *Sea ice, *Ice cover, *Model studies, *Numerical analysis, Equations, Computers, Computer programs, Meteorological data, Atmospheric pressure, Air temperature, Radiation, Albedo, Melting, Seasonal, Evaluation, Testing.
Identifiers: *USSR, *Ice thickness, *Ice compaction, *Ice floes, *Ice drift, Fast ice.

Basic numerical schemes were derived for computing ice distribution in a region of the Arctic basin. A numerical model was developed to analyze the formation of ice cover in the spring-summer period as a result of the combined effect of thermal and dynamic factors and to assess the separate contribution from these factors to ice formation over a long period. The parameters used for the spring-summer period include distribution of ice albedo over the sea surface, temporal variability of the ice albedo, initial state of the ice, air temperatures, distribution of atmospheric pressure, and state of the fast ice. Based on data of a 22-year observation series, the tests fully justify the use of the model for computing ice thickness and compaction over the particular area. (See also W73-05702) (Josefson-USGS)
W73-05704

METHODS OF FORECASTING LONG-TERM VARIATIONS IN ICE COVERAGE OF THE GREENLAND SEA (O MNOGOLETNEY IZMENCHIVOSTI LEDOVITOSTI GRENLANDSKOGO MORYA I METHODIKE YEYE PROGNOZA),
Arkticheskii i Antarkticheskii Nauchno-Issledovatelskii Institut, Leningrad (USSR).
A. A. Kirillov, and M. S. Khromtsova.
In: Issledovaniye ledovogo rezhima arkticheskikh morey i metody prognozov i raschetov; Arkticheskiy i Antarkticheskiy Nauchno-Issledovatel'skiy Institut Trudy, No 303, p 46-54, Leningrad, 1971. 3 fig, 3 tab, 9 ref.

Descriptors: *Ice, *Sea ice, *Ice cover, *Variability, *Forecasting, Meteorology, Meteorological data, Air temperature, Melting, Seasonal, Correlation analysis, Regression analysis, Equations.
Identifiers: *USSR, *Greenland Sea, Drift ice, Ice edge, Isopleths.

Ice coverage of the Greenland Sea is subject to substantial yearly and seasonal variability. Maximum ice coverage is observed in March-April and the minimum in August. Ice coverage in June decreases on the average by 10%, while the highest rate of ice clearing is observed in July. Seasonal ice inertia is fairly pronounced in the sea, whereas the year-to-year inertia is very weak. Close correlations exist between the sea ice coverage and the various indices of thermal and dynamic processes occurring during the antecedent fall-winter period. The most effective index of thermal processes is provided by the air temperature in Barentsburg, West Spitsbergen in October-February. Correlation between the monthly average ice coverage and air temperature in Barentsburg improves from May to August, the correlation coefficient increasing from -0.34 in May to -0.62 in August. Correlation between ice coverage of the Greenland Sea and quantity of warm Atlantic water reaching the Arctic basin from the sea through the Fram Strait also improves from spring to summer. The correlation coefficient in June is as low as -0.10, whereas in July and August it increases to -0.38 and -0.39, respectively. The new ice data, based on an extensive series of observations, yield higher correlation coefficients between sea ice coverage and ice transport from the Arctic basin into the sea. Regression equations are obtained for forecasting ice coverage of the sea in summer months 2-6 months in advance with a reliability of 82%-88%. (See also W73-05702) (Josefson-USGS)
W73-05705

MANIFESTATION OF ATMOSPHERIC CYCLES IN ICE COVERAGE (K OSOBENNOSTYAM PROYAVLENIYA ATMOSFERNYKH TSIKLOV V LEDOVITOSTI),
Arkticheskii i Antarkticheskii Nauchno-Issledovatelskii Institut, Leningrad (USSR).
V. F. Zakharov.
In: Issledovaniye ledovogo rezhima arkticheskikh morey i metody prognozov i raschetov; Arkticheskiy i Antarkticheskiy Nauchno-Issledoyatel'skiy Institut Trudy, No 303, p 55-60, Leningrad, 1971. 2 fig, 11 ref.

Descriptors: *Arctic, *Ice cover, *Cycles, *Meteorology, *Atmosphere, Air temperature, Atmospheric pressure, Variability, Fluctuations.
Identifiers: *USSR, Hydrosphere, Pressure gradient.

The main feature of year-to-year variations in ice coverage of arctic seas is the presence of cyclic changes. Variations in ice coverage reveal cycles of 2-3, 3-4, 4-5, 6-7, 7-9, 9-10, 11, 18-19 years, and longer. Meteorological factors are directly responsible for yearly changes in ice coverage of arctic seas. Air temperature has a direct effect on ice coverage, and cyclic changes in ice coverage produced by air temperature fluctuations constitute a fairly accurate reflection of the atmospheric cyclic process. Cyclic variation in atmospheric pressure has little or no effect on ice coverage. (See also W73-05702) (Josefson-USGS)
W73-05706

EFFECT OF LONG-PERIOD TIDES ON ICE CONDITIONS IN ARCTIC SEAS (K VOPROSU O VLIYANII DOLGOPERIODNYKH PRILIVOV NA LEDOVYYE USLOVIYA ARKTICHESKIKH MOREY),
Arkticheskii i Antarkticheskii Nauchno-Issledovatelskii Institut, Leningrad (USSR).
V. N. Vorob'yev, and Z. M. Gudkovich.
In: Issledovaniye ledovogo rezhima arkticheskikh morey i metody prognozov i raschetov; Arkticheskiy i Antarkticheskiy Nauchno-Issledovatel'skiy Institut Trudy, No 303, p 72-75, Leningrad, 1971. 1 fig, 8 ref.

Descriptors: *Arctic, *Ice, *Sea ice, *Tides, Currents (Water), Winds, Velocity, Navigation, Equations.
Identifiers: *USSR, *Tidal currents, *Tide cycles, Ice compaction, Open pack ice, Close pack ice, Ice drift.

The effect of tidal drift on ice compaction and navigability in arctic seas was investigated. The ef-

fect of tides on ice conditions may be quite significant for regions with a high ice-cover coefficient. Conversely, in regions with open pack ice and large expanses of clear water, the effect of long-period tidal currents is virtually unnoticeable. (See also W73-05702) (Josefson-USGS)
W73-05707

RESULTS OF THE STUDY OF NONUNIFORM ICE DRIFT IN THE ARCTIC BASIN (REZUL'TATY IZUCHENIYA NERAVNOMERNOSTI DREYFA L'DA V ARKTICHESKOM BASSEYNE),
Arkticheskii i Antarkticheskii Nauchno-Issledovatelskii Institut, Leningrad (USSR).
N. A. Volkov, Z. M. Gudkovich, and V. D. Uglev.
In: Issledovaniye ledovogo rezhima arkticheskikh morey i metody prognozov i raschetov; Arkticheskiy i Antarkticheskiy Nauchno-Issledovatel'skiy Institut Trudy, No 303, p 76-88, Leningrad, 1971. 4 fig, 3 tab, 13 ref.

Descriptors: *Arctic, *Ice, *Ice cover, *Ice breakup, *Movement, Diffusion, Turbulence, Winds, Velocity, Meteorology, Correlation analysis, Regression analysis, Computer programs, Equations.
Identifiers: *USSR, *Ice drift, *Drifting ice stations, Ice floes, Ice hummocks, Ice compaction, Ice deformation, Wind drift.

Investigations of nonuniform ice drift and turbulent motion were based on 60 synchronous measurements made between March 26 and May 16, 1962 at four portable drifting stations set up at the corners of an ice polygon in the drift area of the Severnyy polyus-10 (North Pole-10) station to the northeast of the De Long Islands. A computer program was used to derive the rectangular coordinates; the magnitude, direction, and velocity of drift between the astronomical points for each of the stations as well as the distance between the stations; the polygon area; and the orientation of the sides and diagonals of the quadrangle at the times of observation. The resultant drift over the 50 days was directed almost precisely to the north. The various aspects of nonuniform drift and turbulent motion considered require further theoretical and experimental clarification. (See also W73-05702) (Josefson-USGS)
W73-05708

EXCITATION OF COMPRESSIVE STRESSES IN ICE DURING THE HYDRODYNAMIC STAGE OF COMPACT ICE DRIFT (O VOZBUZHDENII USILIY LEDOVOGO SZHATIYA NA GIDRODINAMICHESKOY STADII DREYFA SPOLCHENNYKH L'DOV),
Arkticheskii i Antarkticheskii Nauchno-Issledovatelskii Institut, Leningrad (USSR).
D. Ye. Kheysin.
In: Issledovaniye ledovogo rezhima arkticheskikh morey i metody prognozov i raschetov; Arkticheskiy i Antarkticheskiy Nauchno-Issledovatel'skiy Institut Trudy, No 303, p 89-97, Leningrad, 1971. 11 ref.

Descriptors: *Hydrodynamics, *Ice cover, *Movement, *Compressive strength, *Stress, Shear stress, Compaction, Velocity, Viscosity, Reynolds number, Momentum transfer, Coriolis force, Coasts, Shores, Equations.
Identifiers: *USSR, *Ice drift, *Ice floes, *Compressive stress, Compression, Pressure gradient.

Excitation of ice compression is determined not only by the coastline configuration but also by the physical processes which excite compression in offshore ice in open water bodies. Compression in coastal areas is predominantly static, whereas compression in offshore ice is a dynamic wave process. The compression wave is unstable, so that discontinuities are formed at right angles to the direction of motion. In nature this corresponds to the formation of cracks and ice lanes, which alternate with strips of compact ice. (See also W73-05702) (Josefson-USGS)
W73-05709

EFFECT OF LONG-PERIOD TIDES ON ICE DRIFT IN THE ARCTIC BASIN (VLIYANIYE DOLGOPERIODNYKH PRILIVOV NA DREYF L'DA V ARKTICHESKOM BASSEYNE),
Arkticheskii i Antarkticheskii Nauchno-Issledovatelskii Institut, Leningrad (USSR).
Z. M. Gudkovich, and S. N. Yevdokimov.
In: Issledovaniye ledovogo rezhima arkticheskikh morey i metody prognozoy i raschetov; Arkticheskiy i Antarktichneskiy Nauchno-Issledovatelskiy Institut Trudy, No 303, p 98-107, Leningrad, 1971. 3 fig, 6 tab, 10 ref.

Descriptors: *Arctic, *Ice, *Movement, *Tides, Currents (Water), Winds, Velocity, Computers, Computer programs, Correlation analysis, Fourier analysis, Variability.
Identifiers: *USSR, *Ice drift, *Wind drift, *Tidal currents, *Tide cycles.

Investigations of semimonthly and monthly tides and their effect on ice drift in the Arctic basin were based on data provided by the Severnyy polyus-15 (North Pole-15) station for the 140-day period between May 10 and September 27, 1966. Sufficiently detailed and accurate observations of ice drift and wind were carried out during this period. Ice drift in the Arctic basin is made up of the wind component, associated with the direct instantaneous action of the wind in the particular region and the 'wind-independent' component, associated mainly with the effect of currents independent of the local instantaneous wind. The wind component is decisive for relatively short periods of time whereas the 'wind-independent' component is significant for general drift of ice over long periods. To determine the true characteristics of long-period tidal currents, the correlation method was used to compute the 'wind-independent' component of drift for various tide phases, followed by harmonic analysis of the results. True maximum velocity of the semimonthly tidal current is 1.5 cm/sec, and that of the monthly current is 0.9 cm/sec. Quasi-periodic variations in wind may introduce significant distortions in the characteristics of tidal drift as derived by harmonic analysis. The proposed method almost completely eliminates the effect of wind on ice drift. (See also W73-05702) (Josefson-USGS)
W73-05710

WAVE DRIFT OF AN ISOLATED FLOE (O VELICHINE VOLNOVOGO DREYFA ODINOCHNOY L'DINY),
Arkticheskii i Antarkticheskii Nauchno-Issledovatelskii Institut, Leningrad (USSR).
A. I. Arikainen.
In: Issledovaniye ledovogo rezhima arkticheskikh morey i metody prognozov i raschetov; Arkticheskiy i Antarkticheskiy Nauchno-Issledovatel'skiy Institut Trudy, No 303, p 114-120, Leningrad, 1971. 1 fig, 7 ref.

Descriptors: *Hydrodynamics, *Ice, *Movement, *Waves (Water), Currents (Water), Winds, Velocity, Compaction, Energy, Equations.
Identifiers: *USSR, *Ice floes, *Wave drift, *Wind drift, *Ice drift, Close pack ice, Ice edge, Energy flux.

An equation was developed to express qualitatively and quantitatively the hydrodynamic impact of sea waves on drift of an isolated floe. The resultant drift of a floe is assumed to consist of wave and wind components. Wave-drift velocity is comparable to wind-drift velocity, and for waves traveling upwind the net displacement of a floe is zero. When wave-drift velocity and wind-drift velocity point in the same direction, the floe velocity is doubled. Given the wave elements near the clear-water edge of ice, the effect of waves on the close packing of drifting floes and their displacement can be computed. As a result, close pack ice is observed near the clear-water edge, while less compact ice occurs farther away. The greater the ice compaction, the faster the wave-energy damping. (See also W73-05702) (Josefson-USGS)
W73-05711

EXPERIMENTAL DETERMINATION OF WIND DRAG ON AN ICE SHEET (EKSPERIMENTAL'NOYE OPREDELENIYE SILY VETRA, DEYSTVUYUSHCHEY NA LEDYANOY POKROV),
Arkticheskii i Antarkticheskii Nauchno-Issledovatelskii Institut, Leningrad (USSR).
I. D. Karelin, and L. A. Timokhov.
In: Issledovaniye ledovogo rezhima arkticheskikh morey i metody prognozov i raschetov; Arkticheskiy i Antarkticheskiy Nauchno-Issledovatel'skiy Institut Trudy, No 303, p 155-165, Leningrad, 1971. 3 fig, 2 tab, 4 ref.

Descriptors: *Ice, *Winds, *Wind velocity, *Drag, Tension, Friction, Roughness coefficient, Height, Measurement, Strain gages, Equations.
Identifiers: *USSR, *Lake Ladoga, *Ice sheets, *Ice floes, Fast ice, Wind stress.

Measurements were made of wind stresses on a circular ice floe 10 m in diameter on Lake Lodoga between March 29 and April 10, 1969. Calculations made for wind speeds at a height of 1.0 m show that the calculated value of wind stress may differ from the true value by as much as 25%. When wind stress is computed from wind speeds at heights of 2.0 and 6.5 m, the percentage error is higher. A more promising approach is to determine wind stress as a function of geostrophic wind, air stratification, and the coefficient of roughness by solving a system of dynamics equations. (See also W73-05702) (Josefson-USGS)
W73-05712

STATISTICAL CHARACTERISTICS OF SOME ICE COVER PARAMETERS IN THE ARCTIC (STATISTICHESKIYE KHARAKTERISTIKI NEKOTORYKH PARAMETROV LEDYANOGO POKROVA V ARKTIKE),
Arkticheskii i Antarkticheskii Nauchno-Issledovatelskii Institut, Leningrad (USSR).
A. Ya. Buzuyev, and V. F. Dubovtsev.
In: Issledovaniye ledovogo rezhima arkticheskikh morey i metody prognozov i raschetov; Arkticheskiy i Antarkticheskiy Nauchno-Issledovatel'skiy Institut Trudy, No 303, p 166-179, Leningrad, 1971. 5 fig, 2 tab, 8 ref.

Descriptors: *Arctic, *Ice, *Ice cover, *Snow cover, *Statistical methods, Correlation analysis, Variability, Stochastic processes, Spatial distribution, Navigation, Equations.
Identifiers: *USSR, Ice thickness, Ice hummocks, Fast ice.

Statistical analysis of the spatial variability of ice thickness was based on observations of drift- and fast-ice thicknesses, snow-cover depth, and the top surface level of ice. The nonuniform distribution of ice thickness in space is associated with the effect of random factors. The spatial thickness distribution of old, 1-year, and, most likely, 2-year ice can be expressed by the Charlier distribution function. The unevenness of the top surface of old ice is adequately represented by the thickness of snow cover. Individual parameters characterizing the state of ice cover (hummocking, deterioration, etc.) are analyzed in terms of their contribution to the equivalent ice thickness and its relation to navigation. (See also W73-05707) (Josefson-USGS)
W73-05713

ESTIMATING THE LATERAL MELTING OF DRIFT ICE (K OTSENKE BOKOVOGO TAYANIYA DREYFUYUSHCHIKH L'DIN),
Arkticheskii i Antarkticheskii Nauchno-Issledovatelskii Institut, Leningrad (USSR).
Yu L. Nazintsev.
In: Issledovaniye ledovogo rezhima arkticheskikh morey i metody prognozov i raschetov; Arkticheskiy i Antarkticheskiy Nauchno-Issledovatel'skiy Institut Trudy, No 303, p 180-184, Leningrad, 1971. 2 fig, 1 tab, 2 ref.

Descriptors: *Ice, *Sea ice, *Melting, Melt water, Heat, Temperature, Water temperature, Salinity, Measurement, Estimating.
Identifiers: *USSR, *Drift ice, *Ice floes, Ice thickness, Ice drifting stations.

Observations of small-scale oceanological processes near the edge of a drifting ice floe and measurements of the lateral melting of ice were carried out on the Severnyy polyus-13 (North Pole-13) drifting station in 1966. Lateral melting was measured along two profiles using special equipment firmly secured to brackets frozen into the edge of the ice floe. Ice thickness was about 2.5 m. Salinity distribution was measured in the ice lane and vertical water temperature profiles were taken under the ice, near the edge, and at various distances from the lane. The amount of melting at the bottom surface of ice was also determined in summer at the same points. Melt water, flowing from the ice, spread over the surface of the lane, forming a relatively thin (0.5-1.0 m) layer of low-salinity water with a sharp temperature and salinity discontinuity relative to the underlying sea water. The highest water temperature was observed in the surface layer in the middle of the lane. Lateral melting within the low-salinity layer of the lane was double that at the bottom of the ice floe, with bottom melting increasing significantly only at the very edge of the ice. The contribution of lateral melting increases markedly for smaller floes and must be considered in estimates of total icemelt. (See also W73-05702) (Josefson-USGS)
W73-05714

SNOW ACCUMULATION ON ICE OF THE KARA SEA (O SNEGONAKOPLENII NA L'DAKH KARSKOGO MORYA),
Arkticheskii i Antarkticheskii Nauchno-Issledovatelskii Institut, Leningrad (USSR).
Yu. L. Nazintsev.
In: Issledovaniye ledovogo rezhima arkticheskikh morey i metody prognozov i raschetov; Arkticheskiy i Antarkticheskiy Nauchno-Issledovatel'skiy Institut Trudy, No 303, p 185-190, Leningrad, 1971. 3 fig, 2 tab, 5 ref.

Descriptors: *Snow, *Snow cover, *Ice, *Ice cover, *Sea ice, Meteorology, Snow surveys, Fluctuations, Spring, Equations.
Identifiers: *USSR, *Kara Sea, *Fast ice, Ice hummocks.

The thickness and distribution of snow on ice of the Kara Sea were investigated in relation to climatic conditions and properties of ice cover. The snow cover is thicker on fast ice than on drift ice. The mass of snow deposited on fast ice reaches its maximum during the second 10-day period in May. Snow accumulation in spring on smooth stretches of drift ice is approximately one-third that on fast ice. Yearly fluctuations of snow accumulation on fast and drift ice in this arctic sea are generally comparable. (See also W73-05702) (Josefson-USGS)
W73-05715

MEASUREMENTS OF SHEAR DEFORMATION OF A NATURAL ICEFIELD WITH OPTICAL THEODOLITES (REZUL'TATY IZMERENIYA DEFORMATSII SDVIGA YESTESTVENNOGO LEDYANOGO POLYA OPTICHESKIMI TEODOLITAMI),
Arkticheskii i Antarkticheskii Nauchno-Issledovatelskii Institut, Leningrad (USSR).
A. P. Legen'kov, V. D. Uglev, and N. I. Blinov.
In: Issledovaniye ledovogo rezhima arkticheskikh morey i metody prognozov i raschetov; Arkticheskiy i Antarkticheskiy Nauchno-Issledovatel'skiy Institut Trudy, No 303, p 191-193, Leningrad, 1971. 1 tab, 2 ref.

Descriptors: *Ice, *Sea ice, *Shear, *Measurement, *Instrumentation, Air temperature, Autumn.
Identifiers: *USSR, *Geodesy, *Theodolites, Triangulation, Icefields, Ice floes, Ice drifting stations.

The shear of a multiyear icepack was investigated using horizontal triangulation runs with optical theodolites on the Severnyy polyus-17 (North Pole-17) drifting station in September and October 1968. A triangle with sides measuring 416 m, 365 m, and 750 m was laid out on an ice field of 8 x 10 km and 2-5 m thick, at a distance of 1.5 km from its edge. Eighteen series of simultaneous measurements of the angles were carried out with the TB-1 and OT-02 theodolites between September 16 and October 8. The measurement errors in the angles and in the shear deformation, which in ice fields should not exceed several seconds, were tabulated. (See also W73-05702) (Josefson-USGS)
W73-05716

OBSERVATIONS OF ICE MOTION WITH OPTICAL THEODOLITES ON THE SEVERNYY POLYUS-17 DRIFTING STATION (O NABLYUDENIYAKH ZA PODVIZHKAMI L'DA OPTICHESKIMI TEODOLITAMI NA DREYFUYUSHCHEY STANTSII 'SEVERNYY POLYUS-17'),
Arkticheskii i Antarkticheskii Nauchno-Issledovatelskii Institut, Leningrad (USSR).
A. P. Legen'kov, and V. D. Uglev.
In: Issledovaniye ledovogo rezhima arkticheskikh morey i metody prognozov i raschetov; Arkticheskiy i Antarkticheskiy Nauchno-Issledovatel'skiy Institut Trudy, No 303, p 194-206, Leningrad, 1971. 2 fig, 3 tab, 2 ref.

Descriptors: *Ice, *Sea ice, *Movement, *Measurement, *Instrumentation, Methodology, Mathematics, Equations.
Identifiers: *USSR, *Geodesy, *Theodolites, *Ice floes, Ice sheets, Ice hummocks, Ice compaction, Ice drifting stations.

The methodology and accuracy of observations of ice motion with optical theodolites were investigated on the Severnyy polyus-17 (North Pole-17) drifting station between June 8 and September 10, 1968. The floe on which the drifting station was located was an old ice sheet of approximately 8 x 10 km and 2-5 m thick. The floe was fringed by old and fresh hummocks, some of which were 5-7 m high. The theodolites, mounted on ice hummocks 3 m above sea level, were set on poles frozen into the ice. The errors in the angles measured range from 4 minutes to 28 minutes and may be attributed to atmospheric conditions, motion of the poles, and to lack of experience on the part of observers. (See also W73-05702) (Josefson-USGS)
W73-05717

APPLICATION OF COMPUTERS TO DETERMINATION OF AGE CHARACTERISTICS OF ARCTIC ICE (ISPOL'ZOVANIYE EVM DLYA OPREDELENIYA VOZRASTNYKH KHARAKTERISTIK ARKTICHESKIKH L'DOV),
Arkticheskii i Antarkticheskii Nauchno-Issledovatelskii Institut, Leningrad (USSR).
Yu. P. Novikov.
In: Issledovaniye ledovogo rezhima arkticheskikh morey i metody prognozov i raschetov; Arkticheskiy i Antarkticheskiy Nauchno-Issledovatel'skiy Institut Trudy, No 303, p 207-211, Leningrad, 1971. 5 fig, 1 tab, 5 ref.

Descriptors: *Arctic, *Ice, *Sea ice, *Age, *Computers, Aerial photography, Photometry, Statistical methods, Histograms.
Identifiers: *USSR, Ice thickness, Ice floes.

A computer analysis of thick 1-year ice and old ice was based on use of aerial photographs of arctic ice scanned by an automatic microphotometer developed at the Computer Laboratory of the Arctic and Antarctic Scientific Research Institute in Leningrad. Reliable indices for age differentiation of ice formations can be obtained from the photographs for determination of ice thickness. For further application of the results, the quantitative indices must be improved by using a larger sampling of data, and similar indices must be derived for other ice groups. (See also W73-05702) (Josefson-USGS)
W73-05718

MAP SHOWING LENGTH OF FREEZE-FREE SEASON IN THE SALINA QUADRANGLE, UTAH,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W73-05801

2D. Evaporation and Transpiration

EFFECT OF HERBICIDES AND ANTITRANSPIRANTS ON INTENSITY OF PLANT PHOTOSYNTHESIS AND TRANSPIRATION (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Institut Fiziologii Rastenii i Agrokhimii.
K. N. Pochinok.
Fiziol Biokhim Kul't Rast. Vol 3, No 5, p 538-544. 1971. English summary.
Identifiers: *Herbicides, *Photosynthesis, Plants, *Transpiration, Antitranspirants.

The effect of herbicides on plants is accompanied by an inhibition of photosynthesis and a decrease in transpiration. After first determining the intensity of photosynthesis and transpiration, it is possible to establish the degree of herbicide effect on these processes by expressing it through a coefficient of effectivity. The suggested method makes it possible to follow systematically the effect of a herbicide on the intensity of photosynthesis and transpiration during the whole vegetative period. Similarly, it is possible to establish the presence of antitranspirant properties in chemical substances, and to characterize them by means of an antitranspirant coefficient of effectivity.--Copyright 1972, Biological Abstracts, Inc.
W73-05359

DIURNAL AND SEASONAL TRANSPIRATION DYNAMICS IN PHRAGMITES COMMUNIS TRIN, (IN RUSSIAN),
Ukrainskii Nauchno-Issledovatelskii Institut Lesnogo Khoziaistva, Kharkov (USSR).
T. M. Khashes, and V. I. Bobro.
UKR Bot Zh. Vol 28, No 4, p 521-524. 1971. Illus. English summary.
Identifiers: Air, Diurnal, Dynamics, Humidity, *Phragmites-Communis-M, Seasonal, Temperature, *Transpiration.

The diurnal rhythm of P. communis transpiration is characterized by a single-peak curve with a maximum at non-1 p.m. In the first half of the day, before maximum transpiration, its value correlates with air temperature and deficit of saturation. The coefficient of correlation is 0.8-0.7. In the afternoon, the intensity of transpiration decreases and the coefficient of correlation drops to 0.1 and less in spite of the growing tension of the meteorological conditions. The afternoon drop in transpiration

intensity is conditioned by the physiological state of the leaf.--Copyright 1972, Biological Abstracts, Inc.
W73-05375

TRANSPIRATION AND WATER UPTAKE IN THE FRUIT BODIES OF SOME HYMENOMYCETES,
Ife Univ. (Nigeria). Dept. of Biological Sciences.
M. H. Zoberi.
Physiol Plant. Vol 26, No 2, p 215-220. 1972. Illus.
Identifiers: Agaricus, Amanita, Basidiocarps, Collybia, Coprinus, Fluorescin dye, *Fruit, Hymenium, *Hymenomycetes, Mannitol, Polyporus, Stipes, *Transpiration, Tricholoma.

The relationship between relative humidity and transpiration was studied in the basidiocarps of Coprinus, Amanita, Agaricus, Tricholoma, Collybia and Polyporus. Transpiration decreased with an increase in the humidity and there was virtually no transpiration in nearly saturated air. To determine the relationship between uptake and transpiration, stipes were immersed in solutions of various osmotically active substances and inhibitors. Results showed that uptake has no influence on the transpiration. Additional data suggested that uptake in a detached basidiocarp proceeds as long as the fruiting body is young and healthy. Studies with fluorescein dye and mannitol showed that most transpiration occurs at the surface and edges of the hymenium.--Copyright 1972, Biological Abstracts, Inc.
W73-05502

RESEARCH IN EVAPOTRANSPIRATION 1969--1972,
Nebraska Univ., Lincoln. Water Resources Research Inst.
N. J. Rosenberg.
Available from the National Technical Information Service as PB-214 846, $3.00 in paper copy, $0.95 in microfiche. Project Completion Report, November 1972, Horticulture Progress Report No 96. 273 p, 10 ref, 4 append. OWRR A-017-NEB (4). 14-31-0001-3527.

Descriptors: *Evapotranspiration, *Photosynthesis, *Evaporation, *Transpiration, Water utilization, *Advection, *Windbreaks, Reflectance.
Identifiers: Reflectants.

Results are described of field research conducted at the University of Nebraska Evapotranspiration Research Facility at Mead during the growing seasons of 1969 and 1970. Advances in analytical methods and instrumentation achieved are also described. Windbreaks were shown to markedly reduce the water use by irrigated soybeans with no significant reduction in photosynthetic rate. The water-saving effect was particularly important on days of strong regional advection of sensible heat. Instrumentation developments and field studies during 1969 and 1970 now provide the methodology needed for accurate estimation of CO2 flux rates in the field. These methods depend upon lysimetric determination of the exchange coefficient for water vapor. Sensors for the measurement of net radiation in plant canopies, temperature and humidity gradients above canopies, albedo, surface temperature and CO2 concentrations and gradients have been developed or improved. Sufficient data have been assembled so that probability statements of daily water demand can be made for use in models of regional hydrology, for current water distribution decision making and for use by irrigators on their individual farms.
W73-05579

BIOCLIMATE, LEAF TEMPERATURE, AND PRIMARY PRODUCTION IN RED MANGROVE CANOPIES IN SOUTH FLORIDA,
San Diego State Coll., Calif. Dept. of Biology.
P. C. Miller.
Ecology. Vol 53, No 1, p 22-45, 1972, Illus.
Identifiers: Bioclimate, Canopy, *Florida, *Leaf temperature, Mangrove-D, Photosynthesis, Primary production, Respiration, *Rhizophora-mangle-D, Temperature, *Transpiration.

A model of primary production and transpiration of forest canopies was developed from the energy-budget equation of individual leaves to clarify some of the physical processes affecting primary production. The model calculates hourly vertical profiles of temperature, transpiration, respiration, and gross and net photosynthesis of both sunlit and shaded leaves; and calculates appropriately weighted totals for the hourly water loss and gross and net photosynthesis for each level in the canopy. The model includes variations in leaf resistances caused by changes in absorbed solar radiation and changes in leaf water deficit and also takes into account the interdependence of the infrared profiles and the leaf-temperature profiles within the canopy. The model was tested with data collected on red mangrove (Rhizophora mangle Roxb.) forests. Canopy structure and the daily courses of solar and IR radiation, air temperature, humidity, wind, and ground temperatures were measured and used as input data for the model. The model produced realistic leaf temperatures, leaf resistances, transpiration rates, and primary production rates and was used to indicate the relative importance of environmental variables in influencing leaf temperature, transpiration, and primary production. The environmental variables with the greatest influence on primary production were air temperature and humidity. Production was decreased by increasing air temperature and increasing humidity. Increasing total solar radiation increased production up to a point, then decreased it. Increasing the diffuse fraction of the total solar radiation increased production. Increasing infrared radiation decreased production. Production and transpiration increased with increasing leaf-area index with steeply inclined leaves and leaf absorptance. Production was decreased by increasing leaf-area index with nearly horizontal leaves, leaf width, and the ap value. The canopy distribution of red mangrove appears to be nearly optimum to maximize the efficiency of water utilization rather than production. This indicates that the canopy is adapted to maximize production under conditions of saturated water supply.--Copyright 1972, Biological Abstracts, Inc.
W73-05749

EVAPOTRANSPIRATION OF IRRIGATED HIGH MOUNTAIN MEADOWS IN SOUTHERN WYOMING,
Wyoming Univ., Laramie. Dept. of Civil Engineering.
T. J. Swartz.
M. Sc. Thesis, May 1972. 79 p, 18 tab, 17 fig, 22 ref. OWRR-B-003-WYO (3).

Descriptors: *Evapotranspiration, *Hydrologic budget, *Consumptive use, *Analytical techniques, *Streamflow gages, *Wyoming, Instrumentation, Lysimeters, Hydrology, Hydrologic data, Microenvironment, Regional analysis, Gaging stations.
Identifiers: *Medicine Bow River (Wyo).

An area along the Medicine Bow River in south central Wyoming was instrumented to obtain estimates of consumptive use (evapotranspiration) from irrigated high mountain meadows. The primary objectives were to (1) determine the valley consumptive use by the hydrologic budget, (2) observe the consumptive use by means of tank lysimeters, and (3) compare the measured consumptive use from the tank lysimeters to the evapotranspiration estimates obtained from the Blaney-Criddle and Modified Jensen-Haise methods. A description of the instrumentation required to obtain the necessary data for these methods, the results of the application of these methods, and comparisons of the findings are presented. Estimates of the Blaney-Criddle method were consistently less than the values obtained by any of the other methods. Estimates by the Jensen-Haise method compared favorably, on a weekly basis, with the evapotranspiration measured from the tank lysimeters. Comparisons also showed that estimates by the Modified Jensen-Haise method produced the least discrepancy from the seasonal consumptive use determined by the hydrologic budget. (Black-Arizona)
W73-05765

CLOUD SEEDING INTERPRETED THROUGH ATMOSPHERIC WATER BALANCE,
Colorado State Univ., Fort Collins. Dept. of Atmospheric Science.
For primary bibliographic entry see Field 03B.
W73-05793

SIMULATION OF SALT CEDAR EVAPOTRANSPIRATION,
Colorado Univ., Denver.
W. C. Hughes.
Journal of the Irrigation and Drainage Division, American Society of Civil Engineers, Vol 98, No IR4, Paper 9415, p 533-542, December, 1972. 6 fig, 6 ref, 3 append. NSF Grant GK-27810.

Descriptors: *Evapotranspiration, *Tamarisk, *Winds, Phreatophytes, Equations, Albedo, Stomata, Water loss.
Identifiers: *Roughness (Aerodynamic), *Penman equation.

The use of the Penman equation, as modified by Van Bavel and Monteith, for simulating evapotranspiration from dry plant surfaces requires knowledge of the surface albedo, surface roughness height and stomatal resistance. These variables were determined for salt cedar using measured values of salt cedar evapotranspiration. The equation was insensitive to variations in albedo so that values normally ascribed to vegetated surfaces could be used. The surface roughness height for salt cedar, 305 cm to 396 cm in height, was found to be 37 cm. The relative insensitivity of the equation to small variations in surface roughness height allowed for deviations of 10 cm to 15 cm without appreciable error. Stomatal resistance was varied seasonally from 0.3 sec per cm to over 5 sec per cm and was indirectly related to temperature and directly related to wind speed. Stomatal resistance was related to water depth only during seasons when the plants were inactive. (Knapp-USGS)
W73-05795

2E. Streamflow and Runoff

RECORDS OF HYDROLOGIC DATA, WALTON COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 07C.
W73-05295

THE GREAT TUNISIAN FLOOD,
Geological Survey, Washington, D.C.
F. E. Clarke.
Journal of Research, US Geological Survey, Vol 1, No 1, p 121-124, January - February 1973. 5 fig, 1 ref.

Descriptors: *Floods, *Storms, *Deserts, *Historic floods, Arid lands, Flood recurrence interval, Maximum probable flood, Flood frequency, Peak discharge, Cloudbursts, Africa, Storm runoff, Erosion.
Identifiers: *Tunisia.

In the autumn of 1969, unusual meteorological conditions over Europe and northern Africa caused an enormous persistent desert storm in Tunisia and eastern Algeria. Poorly developed

drainage patterns and gypsum-encrusted surfaces of these desert regions intensified effects of the storm and contributed to the heavy loss of life and property. Destruction of Roman bridges suggests that such storms may have recurrence probabilities of several thousands of years. The event also suggests that, although desert storms are less frequent than those of temperate regions, they can be similar in magnitude. (Knapp-USGS)
W73-05302

EXPERIMENTAL INVESTIGATION OF HYDRODYNAMIC STABILITY ON RIGID AND ELASTIC DAMPING SURFACES,
Akademiya Nauk URSR, Kiev. Inst. of Hydromechanics.
For primary bibliographic entry see Field 08B.
W73-05319

REYNOLDS STRESS MEASUREMENTS IN HYDRAULIC JUMPS,
Toronto Univ. (Ontario). Dept. of Mechanical Engineering.
F. J. Resch, and H. J. Leutheusser.
Journal of Hydraulic Research, Vol 10, No 4, p 409-430, 1972. 7 fig, 17 ref. NCR (Canada) Grant No A-1541.

Descriptors: *Hydraulic jump, *Reynolds number, *Critical flow, Froude number, Hydraulics, Continuity equation, Energy, Turbulence, Turbulent flow.
Identifiers: *Reynolds stress.

Determination of Reynolds stresses allows evaluation of important terms in the energy and momentum equations for calculating hydraulic jumps. Tests were carried out using a double hot-film probe which operates in similar fashion to X-shaped hot wires. A digital method of signal processing was made necessary by the large number of air bubbles in the roller region of the jump. Tests were run in a canal 15 meters long, 0.39 meters wide, and 0.60 meters deep. Jumps with fully developed upstream flow (type I) have quite different internal and external structures from those with potential flow upstream (type II). Type I jumps are much longer than those of type II and their turbulence levels are much higher. This is particularly evident for Froude number F±2.85. The Reynolds stress distributions are at a lower level for F±6.00 than for F±2.85. However, the corresponding Reynolds number magnitudes are Re±111,600 for F±6.00, and Re±241,700 for F±2.85. (Knapp-USGS)
W73-05320

THE INFLUENCE OF SURFACE TENSION ON WEIR FLOW,
Sheffield Univ. (England).
E. J. Sarginson.
Journal of Hydraulic Research, Vol 10, No 4, p 431-446, 1972. 6 fig, 14 ref.

Descriptors: *Weirs, *Stage-discharge relations, *Spillway crests, *Surface tension, Weber number, Overflow, Hydraulics, Streamflow.

For flow over a sharp-crested weir, the discharge coefficient is a simple function of the Weber number. The resulting equation gives discharges which differ by no more than 1.5% from those given by Rehbock's empirical formula over a wide range of heads and approach conditions. For a circular-crested weir, scale effects are also attributable to surface tension. The quantitative effect of surface tension was obtained theoretically, and when used in conjunction with an empirical formula of the Rehbock type, is in close agreement with the data obtained from weirs having crest diameters varying from 6 mm upwards and at heads which ranged from 6 mm to 150 mm. (Knapp-USGS)
W73-05321

SELECTIVE WITHDRAWAL FROM A TWO LAYERED FLUID,
Canterbury Univ., Christchurch (New Zealand). Dept. of Civil Engineering.
I. R. Wood, and K. K. Lai.
Journal of Hydraulic Research, Vol 10, No 4, p 475-496, 1972. 10 fig, 13 ref.

Descriptors: *Stratified flow, *Reservoir releases, *Gradually varied flow, Withdrawal, Water quality control, Mixing, Viscosity, Reservoir storage.

Discharge from a two-layer system when the withdrawal takes place from a slot at the base of a canal leading from a reservoir is analyzed for the case in which the flows are gradually varied and the fluid can be considered as inviscid. The theory can be extended to cover the flow of more than two layers and in this case the number of points at which the computations must be carried out are one less than the number of layers. At all of these points the flow must be gradually varied. With very few complications the theory can also be extended to cover the cases where the slot is above the level of the bottom of the canal and where the lower solid surface is shaped in a similar fashion to the upper surface. Departures from the theory occur when a large proportion of the withdrawal from the upper layer comes from the viscous drag at the interface. This effect is important in interpreting the results from small-scale hydraulic models. (Knapp-USGS)
W73-05323

SOME TSUNAMI STUDIES FOR THE WEST COAST OF CANADA,
Department of the Environment, Ottawa (Ontario). Marine Sciences Branch.
T. S. Murty, and R. F. Henry.
Manuscript Report Series No 28, p 1-46, 1972. 21 fig, 2 tab, 16 ref.

Descriptors: *Tsunamis, *Pacific Ocean, *Canada, *Earthquakes, *Water level fluctuations, Correlation analysis, Tides, Time series analysis, Ocean waves, Inlets (Waterways), Coasts, Mathematical studies, Resonance, Analytical techniques, Energy dissipation.

The propagation of a tsunami into the Fisher-Fitz Hugh complex on the west coast of Canada was computed taking the topography into account. The importance of resonance in tsunami amplification was considered, particularly in the Juan de Fuca Strait and the Cousins Inlet. The tide gage data for the 1964 Alaska earthquake tsunami were evaluated through autocorrelogram analysis and calculation of autospectra. To evaluate the nonlinear coastal effects, the bispectra was computed. Also, the energy processes on the continental shelf off Tofino were examined. Since 1945, there have been five major tsunamis in the Pacific area. The pertinent details are summarized. (Woodard-USGS)
W73-05329

RESONANCE PERIODS OF MULTI--BRANCHED INLETS WITH TSUNAMI AMPLIFICATION,
Department of the Environment, Ottawa (Ontario). Marine Sciences Branch.
For primary bibliographic entry see Field 02L.
W73-05330

EFFECT OF URBAN DEVELOPMENT ON FLOODS IN THE PIEDMONT PROVINCE OF NORTH CAROLINA,
Geological Survey, Raleigh, N.C.
For primary bibliographic entry see Field 04C.
W73-05381

GENERAL CIRCULATION AND WATER CHARACTERISTICS IN THE SOUTHERN CALIFORNIA BIGHT,
Southern California Coastal Water Research Project, Los Angeles.
For primary bibliographic entry see Field 05B.
W73-05415

JOINT DISTRIBUTION FUNCTIONS FOR LINK LENGTHS AND DRAINAGE AREAS,
Thomas J. Watson Research Center, Yorktown Heights, N.Y.
For primary bibliographic entry see Field 04A.
W73-05470

THE TWO DIMENSIONAL SPATIAL ORGANIZATION OF THE PECATONICA RIVER, SOUTHWESTERN WISCONSIN,
Harvard Univ., Cambridge, Mass. Graduate School of Design.
M. J. Woldenberg, and L. Onesti.
Available from NTIS, Springfield, Va 22151 as AD-745 024; Price $3.00 printed copy; $0.95 cents microfiche. Harvard Papers in Theoretical Geography (Geography and the Properties of Surfaces Series), Paper No 46, July 1, 1972. 55 p, 5 fig, 5 tab, 39 ref. (Also known as Office of Naval Research Technical Report 46). ONR Contract 00014-67A-0298.

Descriptors: *Streams, *Classification, *Tributaries, *River systems, *Wisconsin, Model studies, Correlation analysis, Networks, Hydrologic data, Climates, Geology, Lithification, Evaluation, Environmental effects, Vegetation, Slopes, Topography.
Identifiers: *Stream branching ratio, *Pecatonica River (Wis), *Stream orders.

The Pecatonica River in Wisconsin, an eighth order stream with over 28,000 first order streams, was analyzed. The type of mixed hexagonal hierarchy found is approximately the same as that found in Clear Creek and Old Man Creek Iowa (seventh order) and in many other streams developed on different lithologies and under different climatic regimes in the United States. This hierarchy, with a branching ratio of about 4.5, is thought to be very common and may well predominate in natural stream networks. The network was ordered according to the method suggested by Strahler. This scheme designates unbranched fingertip tributaries as streams of order one. Order is increased by one when two streams of equal order join. Any lower order stream entering a higher order stream below the order forming junction will not affect the order of that stream. (Woodard-USGS)
W73-05473

MATHEMATICAL MODEL OF TIDAL REGIMES IN THE BAY OF FUNDY,
Lasalle Hydraulic Lab. Ltd. (Quebec).
For primary bibliographic entry see Field 02L.
W73-05475

EQUILIBRIUM CROSS-SECTION OF MEANDERING AND BRAIDED RIVERS,
Ife Univ. (Nigeria). Dept. of Geology.
For primary bibliographic entry see Field 08B.
W73-05488

RELUCTIVE, INDUCTIVE, AND EDDY-CURRENT PRESSURE TRANSDUCERS.
For primary bibliographic entry see Field 07B.
W73-05516

MASS FLOW MEASUREMENT.
For primary bibliographic entry see Field 07B.
W73-05517

NEW FLOWMETER IMPROVES ACCURACY A HUNDREDFOLD.

Control Engineering, Vol 19, No 7, p 44, July 1972.

Descriptors: *Instrumentation, *Velocity, *Current meters, *Discharge (Water), Measurements, Water analysis, Control systems, Data collections, Design, *Electronic equipment, Momentum equation, Pipelines, Distribution systems, Flow, Current (Water), Efficiencies, Mathematics, Equations, Equipment, Analysis.
Identifiers: Precision.

A portable acoustic flowmeter developed by the Westinghouse Ocean Research Center, Annapolis, Maryland, is capable of measuring flow from 0.003 ft/sec to 300 ft/sec with an accuracy of plus or minus 0.01 percent (a hundredfold improvement over conventional techniques). A by-product of this improved accuracy is the ability to calculate the efficiency of hydroelectric machinery with much greater accuracy. Efficiency hydroelectric machinery is calculated using three measurements: shaft horsepower, hydraulic head, and waterflow. The accuracy of shaft horsepower and hydraulic head readings can be plus or minus 0.3 percent and plus or minus 0.1 percent, respectively, but the plus or minus 1 percent offered by conventional flowmeters tends to degrade the efficiency calculations. In addition to improved accuracy, the new system does not obstruct the passage of water and does not depend on pipe diameter, nor does the machine require calibration for the determination of water discharge velocities. The principle and a simplified block diagram of the new flowmeter are illustrated. (Long-Battelle)
W73-05534

HEATED SENSOR MASS FLOWMETER,
CGS Scientific Corp., Watertown, Mass. Datametrics Div.
For primary bibliographic entry see Field 07B.
W73-05547

SOME CASE STUDIES OF VERTICAL CIRCULATIONS ASSOCIATED WITH OCEANIC FRONTS,
Saint Louis Univ., Mo. Dept. of Earth and Atmospheric Sciences.
G. V. Rao, and T. S. Murty.
Journal of Geophysical Research, Vol 78, No 3, p 549-557, January 20, 1973. 6 fig, 3 tab, 14 ref.

Descriptors: *Ocean currents, *Ocean circulation, *Water temperature, Water circulation, Currents (Water), Oceanography.
Identifiers: *Oceanic fronts.

Large-scale oceanic circulations are nearly nondivergent. Vertical motion in the oceans is estimated from scale analyses to be of the order of 0.001 to 0.01 cm per sec. These estimates, however, are inapplicable when significant deviations in the oceanic variables occur over small distance scales, in the case of oceanic thermal fronts. A simple numerical model was developed to calculate upwelling in these special situations. In the model the circulation underneath a front is a result of the action of three forces: (1) differential hydrostatic pressure gradient force, a function of the slope of the front and the density contrast between the two water masses, (2) ageostrophic acceleration, a function of the Coriolis parameter and the ageostrophic velocity, and (3) viscous force. Case studies of fronts, two in the Atlantic and three in the Pacific, disclosed that the typical values of the vertical velocities are usually about 0.1 cm per sec. For these cases the slope of the front varied considerably in the horizontal, and owing to this factor the horizontal current field in a vertical column differed appreciably from that in the adjacent region. This difference induced horizontal convergence or divergence and was most pronounced where the frontal slope reached a sharp maximum. In the region under the front, as it approached the surface, mainly viscous force and the differential hydrostatic pressure gradient force counteract each other. In the upper and middle layers the hydrostatic pressure gradient force and the ageostrophic acceleration balance each other. (Knapp-USGS)
W73-05676

INTERNAL UNDULAR SURGES IN SENECA LAKE: A NATURAL OCCURRENCE OF SOLITONS,
Lamont-Doherty Geological Observatory, Palisades, N.Y.
For primary bibliographic entry see Field 02H.
W73-05677

LOW-FLOW CHARACTERISTICS OF STREAMS IN THE PUGET SOUND REGION, WASHINGTON,
Geological Survey, Tacoma, Wash.
F. T. Hidaka.
Geological Survey open-file report, 1973. 55 p, 11 fig, 4 tab, 2 ref. Tacoma, Wash.

Descriptors: *Low flow, *Streamflow, *Low-flow frequency, *Basic data collections, *Washington, Flow rates, Discharge measurement, Correlation analysis, Topography, Slopes, Geology, Climates, Mountains, Sounds, Gaging stations, Precipitation (Atomospheric), Hydrologic data.
Identifiers: *Puget Sound region (Wash).

Low-flow characteristics of streams in the Puget Sound region, Washington, are described, and some of the factors that influence low flow are explained. Four indexes computed from data collected at 150 gaging stations were used as a basis to compare low-flow characteristics of the streams. The indexes are the (1) low-flow-yield index, expressed in unit runoff per square mile; (2) base-flow index, or the ratio of the median 7-day low flow to the average discharge; (3) slope index, or slope of annual 7-day low-flow-frequency curve; and (4) spacing index, or spread between the 7-day and 183-day low-flow-frequency curves. The indexes show a wide variation between streams due to the complex interrelation between climate, topography, and geology. The largest low-flow-yield indexes determined--greater than 1.5 cfs per square mile--were for streams that head at high altitudes in the Cascade and Olympic Mountains and have their sources at glaciers. The smallest low-flow-yield indexes--less than 0.5 cfs per square mile--were for the small streams that drain the lowlands adjacent to Puget Sound. (Woodard-USGS)
W73-05679

SINUOSITY OF SUPRAGLACIAL STREAMS,
Hull Univ. (England). Dept. of Geography.
R. I. Ferguson.
Geological Society of America Bulletin, Vol 84, No 1, p 251-255, January 1973. 3 fig, 10 ref.

Descriptors: *Meanders, *Open channel flow, *Glaciohydrology, *Channel morphology, Melt water, Hydraulics, Erosion, Melting, Heat transfer, Hydrodynamics.

Measurements of the flow and channel form of supraglacial streams, mostly perennial, on a Swiss valley glacier are analyzed for comparison with normal alluvial rivers. Channel incision depths can be explained by a simple model taking into account frictional melting and direct ablation. Stream widths are proportional to the square root of discharge. Discriminant and regression analyses support the theory that maximum sinuosities develop in streams with the highest initial rates of power expenditure per unit bed area. (Knapp-USGS)
W73-05680

HYDRAULIC DRAG: A MEANDER-INITIATING MECHANISM,
Herbert H. Lehman Coll., Bronx, N.Y. Dept. of Geology and Geography.
M. A. Gorycki.
Geological Society of America Bulletin, Vol 84, No 1, p 175-186, January 1973. 16 fig, 21 ref.

Descriptors: *Drag, *Flow friction, *Rotational flow, *Meanders, *Open channel flow, Hydraulics, Turbulence, Vortices, Turbulent flow, Sediment transport.
Identifiers: Helical flow.

Meandering is an intrinsic property of streamflow that is essentially independent of the effects of sediment. This can be easily demonstrated on a simplified sediment-free stream table composed of an inclined hydrophobic plane surface on which a small stream of water flows. Development of a meander series from a straight and then sinuous stream is induced by increasing water flow. Sinuous water motion (meandering thalweg) of straight reaches is genetically related to the bends of meandering streams. Dimensional ratios of wave length of meandering thalweg to stream width in the straight stream, or stream width to meander length and radius curvature in the meandering stream, closely match those of streams in nature. Introduced granules form point bars spaced approximately two to three times the stream width in the straight stream and five to seven times the stream width in the meandering stream in accordance with field observations. Reversing helical flow can be demonstrated in the meander bends; this is an exaggeration of sinuous water motion or hydraulic drag already present in the straight stream. (Knapp-USGS)
W73-05682

EFFECT OF LONG-PERIOD TIDES ON ICE CONDITIONS IN ARCTIC SEAS (K VOPROSU O VLIYANII DOLGOPERIODNYKH PRILIVOV NA LEDOVYYE USLOVIYA ARKTICHESKIKH MOREY),
Arkticheskii i Antarkticheskii Nauchno-Issledovatelskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 02C.
W73-05707

EFFECT OF VEGETAL LENGTH AND SPATIALLY VARIED FLOW ON VELOCITY DISTRIBUTION COEFFICIENTS,
Department of Agriculture, Stillwater, Okla.
For primary bibliographic entry see Field 08B.
W73-05720

A GENERAL RELAXATION THEORY OF SIMPLE LIQUIDS,
Case Western Reserve Univ., Cleveland, Ohio.
For primary bibliographic entry see Field 08B.
W73-05792

CORRELATION TECHNIQUES AND MEASUREMENTS OF WAVE-HEIGHT STATISTICS,
Stanford Research Inst., Menlo Park, Calif.
For primary bibliographic entry see Field 07B.
W73-05804

LOSS OF INFORMATION BY DISCRETIZING HYDROLOGIC SERIES,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 07C.
W73-05806

MAP SHOWING AREAS OF PAST FLOODING IN THE PARKER QUADRANGLE, ARAPAHOE AND DOUGLAS COUNTIES, COLORADO,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W73-05807

2F. Groundwater

APPLICATION OF SEISMIC SHEAR WAVE STUDIES TO THE INVESTIGATION OF AQUIFERS,
Michigan State Univ., East Lansing. Dept. of Geology.
H. F. Bennett.
Available from the National Technical Information Service as PB-214 678, $3.00 in paper copy, $0.95 in microfiche. Michigan Institute of Water Research Project Completion Report January, 1973. 65 p, 43 fig, 25 ref. OWRR B-006-MICH (3). 14-01-0001-1513.

Descriptors: *Seismic studies, *Seismic waves, *Aquifer testing, Geophysics, Porosity.
Identifiers: *Seismic refraction, Shear waves, Compressional waves, Rayleigh waves.

The use of seismic shear waves to evaluate ground water aquifers was investigated. The study centered around the generation and detection of shear waves in an area consisting of 500 feet of loosely consolidated sands with depths to water table between 5 feet and 35 feet. The generation of shear waves over long distances was unsuccessful and the study turned to identifying shear wave arrivals on the three component recording array. Compressional to shear wave conversions from the base of the sand layer indicate that shear wave velocities increase in the saturated sand. This observation is confirmed by the normal dispersion of the Rayleigh Wave Train. Most noticeable is the five-fold increase in compressional wave velocity in the saturated sand as compared to the velocity in the dry surface layer. This factor causes much of the source energy to be trapped in a surface layer wave guide giving rise to long surface wave trains. The change in compressional wave velocity at the water table interface may be a potential indicator of aquifer porosity.
W73-05202

RECORDS OF SELECTED WATER WELLS AND TEST HOLES IN THE OKLAHOMA PANHANDLE,
Geological Survey, Oklahoma City, Okla.
For primary bibliographic entry see Field 07C.
W73-05294

THE EXERGY OF THERMAL WATER,
Oregon State Univ., Corvallis. School of Oceanography.
For primary bibliographic entry see Field 02K.
W73-05296

GEOLOGICAL ASPECTS OF THERMAL WATER OCCURRENCES IN HUNGARY,
Research Inst. for Water Resources Development, Budapest (Hungary).
For primary bibliographic entry see Field 02K.
W73-05297

OCCURRENCE AND QUALITY OF GROUND WATER IN CRYSTALLINE ROCKS OF THE LLANO AREA, TEXAS,
West Virginia Geological and Economic Survey, Morgantown.
For primary bibliographic entry see Field 04B.
W73-05303

PHYSICS OF BRINE CONING BENEATH SKIMMING WELLS,
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 04B.
W73-05305

DETERMINING WEDGE ANGLE FOR A WEDGE AQUIFER,
Department of the Environment, Ottawa (Ontario). Inland Waters Branch.
For primary bibliographic entry see Field 04B.
W73-05306

STARTING CONDITIONS FOR AQUIFER SIMULATIONS,
Birmingham Univ. (England). Dept. of Civil Engineering.
K. R. Rushton, and L. A. Wedderburn.
Ground Water, Vol 11, No 1, p 37-42, January-February 1973. 8 fig, 1 tab, 2 ref.

Descriptors: *Simulation analysis, *Aquifer characteristics, Drawdown, Groundwater movement, Water storage, Water balance, Water yield, Hydrogeology, Steady flow, Unsteady flow, Water levels, Model studies, Mathematical models.

The importance of starting an aquifer simulation from correct initial conditions is discussed. The errors that will arise if the simulation starts from zero or average heads are determined. Recommendations for minimizing these errors are made. (Knapp-USGS)
W73-05307

SINKHOLE FURNISHES EMERGENCY WATER SUPPLY,
Watson and Co., Tampa, Fla. Dept. of Civil Engineering.
For primary bibliographic entry see Field 04B.
W73-05314

INTERFERENCE BETWEEN PARTIALLY PENETRATING WELLS IN AN ARTESIAN AQUIFER,
Indian Inst. of Tech., Kharagpur. Dept. of Civil Engineering.
For primary bibliographic entry see Field 04B.
W73-05322

LIQUID MOVEMENT THROUGH KAOLINITE UNDER HYDRAULIC, ELECTRIC, AND OSMOTIC GRADIENTS,
Geological Survey, Menlo Park, Calif.
H. W. Olsen.
American Association of Petroleum Geologists Bulletin, Vol 56, No 10, p 2022-2028, October 1972. 8 fig, 9 ref.

Descriptors: *Groundwater movement, *Clay minerals, *Electrochemistry, *Kaolinite, *Osmosis, Electro-osmosis, Diffusion, Seepage, Hydraulic conductivity, Darcys law.
Identifiers: Osmotic conductivity.

Hydraulic, osmotic, and electro-osmotic conductivities of sodium kaolinite were measured as a function of compaction pressure ranging from 1 atm to approximately 600 atm. The data were used to estimate the relative importance of osmosis and electro-osmosis, compared with hydraulic flow, through confining beds at different depths of burial. The results indicate that Darcy's law is not a sufficient basis for predicting either the magnitudes or the directions of liquid movement through deep confining beds. (Knapp-USGS)
W73-05327

GEOMORPHIC REGIMEN OF SMALL WATERSHEDS IN LOESS, TAMA COUNTY, IOWA,
Iowa State Univ., Ames. Dept. of Agronomy.
For primary bibliographic entry see Field 02A.
W73-05328

GROUND-WATER AVAILABILITY IN THE WHITE RIVER JUNCTION AREA, VERMONT,
Geological Survey, Montpelier, Vt.
For primary bibliographic entry see Field 04B.
W73-05332

ALTERNATIVES TO THE HEATING AND EVAPORATION OF GROUNDWATER WHILE STILL SATISFYING THE U.S. ENERGY APPETITE,
For primary bibliographic entry see Field 05C.
W73-05350

WATER FROM THE PRINCIPAL ARTESIAN AQUIFER IN COASTAL GEORGIA,
Geological Survey, Atlanta, Ga.
For primary bibliographic entry see Field 07C.
W73-05472

WATER RESOURCES IN THE NORTHERN SAHARA,
For primary bibliographic entry see Field 04B.
W73-05484

SEA-WATER INTRUSION IN THE UPPER PART OF THE FLORIDAN AQUIFER IN COASTAL PASCO COUNTY, FLORIDA, 1969,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 07C.
W73-05485

SALINE-WATER INTRUSION FROM DEEP ARTESIAN SOURCES IN THE MCGREGOR ISLES AREA OF LEE COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla.
C. R. Sproul, D. H. Boggess, and H. J. Woodard.
Florida Bureau of Geology Information Circular No 75, 1972. 34 p, 9 fig, 3 tab, 7 ref.

Descriptors: *Saline water intrusion, *Groundwater movement, *Artesian aquifers, *Florida, *Aquifer characteristics, Salinity, Chlorides, Water temperature, Hydraulic properties, Hydrogeology, Water wells, Water supply, Water quality, Chemical analysis, Fractures (Geologic), Artesian heads.
Identifiers: *Lee County (Fla).

Upward leakage of saline water from an artesian aquifer below 1,500 feet has caused an increase in chloride concentration in the lower Hawthorn aquifer in Lee County, Florida, from less than 1,000 mg/liter to values ranging from about 1,300 to 15,000 mg/liter. Similarly the higher temperatures of the intruding water has caused an increase in water temperatures in the aquifer from 82 F to values ranging from 83 to 93 F. The intruding water moves upward either through the open borehole of deep wells or test holes, or along a fault or fracture system. The saline water moves from the lower Hawthorn aquifer into the upper Hawthorn aquifer through the open borehole of wells, which connect the aquifers. This movement has resulted in an increase in chloride from less than 200 mg/liter in the unaffected parts of the upper Hawthorn aquifer to values ranging from about 300 to more than 3,000 mg/liter in parts of the aquifer affected by upward leakage. The upper Hawthorn aquifer is the principal source of groundwater supply for public water-supply systems in western Lee County. The spread of saline water throughout most of the McGregor Isles area was continuing as of 1971. (Woodard-USGS)
W73-05487

EVALUATION OF YIELDS OF WELLS IN CONSOLIDATED ROCKS, VIRGINIA TO MAINE,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 04B.
W73-05493

ELECTRIC ANALOG MODEL STUDY OF THE UPPER WHITE RIVER BASIN, INDIANA,
Geological Survey, Indianapolis, Ind.
For primary bibliographic entry see Field 04B.
W73-05495

WATER IN ST. JOHN, U.S. VIRGIN ISLANDS,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 04B.
W73-05496

PORE FLUID AND THE MECHANICAL BEHAVIOR OF ROCK,
Minnesota Univ., Minneapolis. Dept. of Civil and Mineral Engineering.
For primary bibliographic entry see Field 08E.
W73-05674

THEORETICAL STUDY OF DISPERSION IN A FRACTURED ROCK AQUIFER,
Northwestern Univ., Evanston, Ill. Technological Inst.
For primary bibliographic entry see Field 05B.
W73-05675

CLAY MINERALS IN CARBONATE RESERVOIR ROCKS AND THEIR SIGNIFICANCE IN POROSITY STUDIES,
Dalhousie Univ., Halifax, (Nova Scotia). Dept. of Geology.
For primary bibliographic entry see Field 02J.
W73-05686

PRELIMINARY APPRAISAL OF GROUND-WATER CONDITIONS IN THE VICINITY OF MODESTO, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 04B.
W73-05689

GROUND-WATER LEVELS IN THE UNITED STATES, 1966-70, SOUTHWESTERN STATES.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 04B.
W73-05692

SUBMARINE HOT SPRINGS AS A SOURCE OF ACTIVE RIDGE SEDIMENTS,
Rosenstiel School of Marine and Atmospheric Science, Miami, Fla.
For primary bibliographic entry see Field 02J.
W73-05697

GROUNDWATER IN THE UPPER CHARA ARTESIAN BASIN (PODZEMNYYE VODY VERKHNE-CHARSKOGO ARTEZIANSKOGO BASSEYNA),
Moskovskii Geologorazvedochnyi Institut (USSR).
R. Ya. Koldysheva, and K. A. Chernyavskaya.
Izvestiya Vysshikh Uchebnykh Zavedeniy, Geologiya i Razvedka, No 6, p 133-138, June 1972. 1 fig, 8 ref.

Descriptors: *Hydrogeology, *Groundwater, *Groundwater basins, *Artesian aquifers, *Confined water, Springs, Wells, Lakes, Permafrost, Ice, Water quality, Water chemistry, Chemical analysis, Quaternary period.
Identifiers: *USSR, *East Siberia, *Chara River, Mineralization, Tectonics, Taliks, Polynyas, Naleds.

The Upper Chara artesian basin is located within the high-mountain Kodar and Udokan ridges in the northeastern part of the Stanovoye Upland in East Siberia. The basin is named after the Upper Chara depression, which covers 2,300 sq km and occupies the central portion of the basin. Runoff of the Chara River near the Chara settlement varies between 3.2 and 5.4 cu m/sec. The river water has a sodium-calcium bicarbonate composition and a mineralization of 0.08 g/liter, while magnesium and calcium bicarbonates with a mineralization of 0.01-0.03 g/liter are characteristic of lakes, which cover about 4.5% of the basin area. Water of the Chara River near Lake Leprindo has a calcium-magnesium bicarbonate-chloride composition and a mineralization of 0.02 g/liter. Characteristic features of the basin include: (1) significant long-term freezing of groundwater recharge and storage areas; (2) location of aquifers in unfrozen ground within permafrost (taliks) situated preferentially near fault zones; (3) presence of large amounts of subpermafrost waters in thick Middle Quaternary lacustrine and alluvial sandy-pebble deposits in the central part of the basin; and (4) presence of unusually fresh water in the basin and deep leaching of rocks in the areas of groundwater recharge and storage. (Josefson-USGS)
W73-05701

SOIL HYDROLOGY IN A SEMIARID WATERSHED,
Agricultural Research Service, Weslaco, Tex.
For primary bibliographic entry see Field 04B.
W73-05785

MAP SHOWING GROUND-WATER POTENTIAL IN THE ASPEN QUADRANGLE, PITKIN COUNTY, COLORADO,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W73-05802

BIBLIOGRAPHY OF GROUNDWATER STUDIES IN NEW MEXICO.

Special Publication, New Mexico State Engineer, Santa Fe, New Mexico, March, 1972. R. L. Burton, Compiler, 28 p, 274 ref.

Descriptors: Groundwater, *Groundwater availability, *Groundwater resources, *New Mexico, *Bibliographies, Geologic investigations, Geological surveys, Hydrology, *Hydrologic data, Publications.
Identifiers: Groundwater studies, Literature collections.

This publication has been prepared because of an increasing need for information on available publications and studies dealing with New Mexico's groundwater resources. Presented are most of the existing publications and studies. The bibliographic listing is in alphabetical order by the author's name, or by the publishing agency if no author is given. Each citation has been assigned a designation letter according to the increasing intensity and detailed nature of the study: a) reconnaissance; b) qualitative; and c) quantitative. The letter p has been added to designate in-progress studies. A map of New Mexico accompanies the bibliography as a centerspread. On it the numbered citations are located within yellow, blue, and red areas according to the total area covered by the highest ranking designation. The numbers of the highest ranking citations, together with lower ranking designations and inprogress studies falling within the area, are located near the subject area of the citation where practicable. (Campbell-NWWA)
W73-05819

2G. Water in Soils

ECOLOGY OF SULFUR-OXIDIZING BACTERIA IN HOT ACID SOILS,
Indiana Univ., Bloomington. Dept. of Microbiology.
For primary bibliographic entry see Field 05B.
W73-05262

FIELD DETERMINATION OF NANOGRAM QUANTITIES OF MERCURY IN SOILS AND ROCKS,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 02K.
W73-05410

MEASUREMENT OF MOISTURE IN TYPICAL CHERNOZEM SOIL WITH AN AM-11 RESISTANCE SOIL MOISTURE METER,
N. Slavov.
Available from NTIS, Springfield, Va 22151, N72-22374 - Price $3.00 printed copy; $0.95 in microfiche. National Aeronautics and Space Administrative Technical Translation Report NASA TT-F-14245, April 1972. 5 p, 3 fig, 5 ref. (Translation of Izmervane vlazhnostta na tipichniya chernozem s omicheski pochven vlagomer AM-11: Khidrologiya i Meteorologiya, Vol 16, No 5, p 67-69, 1967).

Descriptors: *Soil moisture meters, *Soil moisture, *Chernozems, *Testing procedures, *Foreign countries, Instrumentation, Evaluation, Correlation analysis, Gravimetric analysis.
Identifiers: *Resistance soil moisture meter, *Bulgaria.

Laboratory and field tests of the Am-11 moisture meter were made to ascertain its suitability for operation in typical chernozem soil. The tests were conducted by the Corn Institute in Knezha, Bulgaria, during the period from 1963 to 1965. The AM-11 meter consists of an M-1101 type megohmmeter and a set of transducers for soil moisture measurement to a depth of 100 centimeters. The instrument was tested under field conditions at depths of 20, 40, 60, 80, 100, 120, 140 and 160 centimeters with 10 repetitions. The laboratory tests were compared with the gravimetric method. The accuracy of soil moisture determination by the AM-11 instrument is less than by the gravimetric method. It can be used only for mass observations of soil moisture in forecasting the time for watering in irrigation systems and other cases. (Woodard-USGS)
W73-05468

THE NEUTRON METHOD FOR MEASURING SOIL MOISTURE CONTENT--A REVIEW,
Hull Univ. (England). Dept. of Geography.
M. Visvalingam, and J. D. Tandy.
Journal of Soil Science, Vol 23, No 4, p 499-511, December 1972. 68 ref.

Descriptors: *Soil moisture meters, *Nuclear moisture meters, *Bibliographies, *Reviews, Nuclear meters, Moisture content.
Identifiers: *Neutron moisture meters.

The neutron scattering method estimates the moisture content of the soil by measurement of its hydrogen content. Theoretical and practical aspects of the method are reviewed. (Knapp-USGS)
W73-05489

THE MECHANICAL STRENGTH OF UNSATURATED POROUS GRANULAR MATERIAL,
Agricultural Research Council, Cambridge (England). Unit of Soil Physics.
G. D. Towner, and E. C. Childs.
Journal of Soil Science, Vol 23, No 4, p 481-498, December 1972. 12 fig, 13 ref.

Descriptors: *Soil strength, *Moisture content, *Soil moisture, Porous media, Saturation, Soil mechanics, Soil physical properties, Soil water.

The influence of pore-water suction on the strength of a porous material is that it contributes a compressive load which increases the shear strength. When the material is unsaturated, the normal load or effective stress is due in part to the continuous water at measured suction in unemp-

tied pores, and in part to isolated bodies in nominally emptied pores at suctions approximating to the suction at emptying. The effective stress is determined experimentally by unconfined compression tests on samples with imposed pore water suctions, and the dependence on this suction confirms reasonably that which is predicted by the theoretical formulas. (Knapp-USGS)
W73-05490

THE RELATION BETWEEN BULK DENSITY, AVAILABLE WATER CAPACITY, AND AIR CAPACITY OF SOILS,
Agricultural Development and Advisory Service, London (England).
J. R. Archer, and P. D. Smith.
Journal of Soil Science, Vol 23, No 4, p 475-480, December 1972. 1 fig, 2 tab, 19 ref.

Descriptors: *Bulk density, *Available water, *Field capacity, Soil moisture, Moisture availability, Moisture tension, Density, Soil physical properties, Soil density, Compaction, Soil management.
Identifiers: Air capacity (Soils).

The effect of bulk density on moisture content was studied at 50 mb tension in four soils of different textures. The volumetric water content increased linearly with bulk density over a wide range of densities. Depending on texture, a maximum bulk density was reached above which continued compaction decreased the water content. This is the point at which the air capacity of the soil at this tension approaches zero. If the gravimetric wilting point depends mainly on texture, the available water capacity varies in a manner similar to the 50 mb water content. The available water capacity and air capacity may be optimized using cultivation techniques to adjust the bulk density. The available water capacity of coarse-textured droughty soils may be increased by increasing the bulk density provided that the air capacity remains above acceptable lower limits (10-15%). The air capacity of compacted soils with large available-water capacities could be increased by reducing the bulk density to a value corresponding to an acceptable available-water capacity. In very compacted soils a decrease in bulk density will benefit both available-water capacity and air capacity. (Knapp-USGS)
W73-05491

THE MEASUREMENT AND PREDICTION OF AVAILABLE WATER CAPACITY OF FERRALLITIC SOILS IN UGANDA,
Makerere Univ., Kampala (Uganda). Dept. of Soil Science.
J. D. Pidgeon.
Journal of Soil Science, Vol 23, No 4, p 431-441, December 1972. 3 tab, 11 ref.

Descriptors: *Soil moistrure, *Clay minerals, *Available water, Kaolinite, Montmorillonite, Moisture availability, Moisture tension, Particle size, Retention, Field capacity, Soil moisture meters.
Identifiers: *Uganda.

Field capacity was measured directly, and soil moisture characteristics were determined on undisturbed cores, for a wide textural range of ferrallitic soils in Uganda. The initial moisture conditions of the soils affect results; therefore standardized procedures were adopted for field and laboratory determinations. Laboratory estimates of field capacity for undisturbed and disturbed samples were unreliable, but a correction factor was found which improved them. There was no single moisture tension for undisturbed core samples that corresponded to field capacity. Particle-size composition could be related to field capacity, permanent wilting point, and available water capacity by multiple regression equations. Particle-size composition following gentle dispersion by shaking soil with distilled water was poorly correlated with moisture-holding properties. There was little advantage in using vigorous ultrasonic dispersion compared with overnight shaking with sodium hexametaphosphate. Two soils formed on alluvial deposits with kaolinite as the only clay mineral, and one soil with montmorillonite as the dominant clay mineral showed markedly different relationships between moisture-holding properties and particule-size composition. (Knapp-USGS)
W73-05492

AN IMPROVED GAS CHROMATOGRAPHIC METHOD FOR THE ANALYSIS OF 5,6--DICHLORO-2-TRIFLUOROMETHYLBEN ZIMIDAZOLE IN SOIL,
Pennsylvania State Univ., University Park. Pesticide Research Lab.
For primary bibliographic entry see Field 05A.
W73-05535

AMMONIUM, NITRATE, AND TOTAL NITROGEN IN THE SOIL WATER OF FEEDLOT AND FIELD SOIL PROFILES,
Agricultural Research Service, Lincoln, Nebr. Soil and Water Conservation Research Div.
L. F. Elliott, T. M. McCalia, L. N. Miekle, and T.A. Travis.
Appl Microbiol. Vol 23, No 4, p 810-813. 1972. Illus.
Identifiers: *Ammonium, Cows, *Feedlots, Nitrate, *Nitrif1cation, Nitrogen, *Soil profiles, Water.

A level beef feedlot, located in an area consisting of Wann silt loam changing with depth to sand, appears to contribute no more NO3- nitrogen, NH4+ nitrogen, and total nitrogen to the shallow water table beneath it than an adjacent cropped field. Soil water samples collected at 46, 76, and 107 cm beneath the feedlot surface generally showed NO3- nitrogen concentrations of less than 1 micro g/ ml. During the summer months, soil water NO3- nitrogen increased at the 15-cm depth, indicating that nitrification took place at the feedlot surface. However, the low soil water NO3- nitrogen values below 15 cm indicate that denitrification takes place beneath the surface.--Copyright 1972, Biological Abstracts, Inc.
W73-05550

THE USE OF TENSIOMETERS IN STUDYING THE WATER CYCLE OF SOILS IN SWAMPY FORESTS,
M. I. Vomperskaya, and I. I. Sudnitsyn.
Available from NTIS, Springfield, Va 22151 as N72-20357 Price $3.00 printed copy, 95 cents microfiche. National Aeronautics and Space Administration Technical Translation Report NASA TT F-14, 218, April 1972. 5 p, 3 fig. (Translation of 'Ispol'zovaniye tenziometrov pri izuchenii vodnogo rezhima pochv v zabolochennykh lesakh, Lesnoye Khozyaystov, Vol 19, No 8, p 28-29, August 1966).

Descriptors: *Soil water, *Soil moisture meters, *Moisture content, *Tensiometers, *Hydrostatic pressure, Forestry, Methodology, Testing procedure, Drilling, Correlation analysis, Soil properties, Swamps, Hydrology.

In excessively moist forests the productiveness of standing timber depends on the dynamics of the wetness of the upper root-saturated soil horizon. In order to study the effect of any meliorative and forest husbandry measures on the growth of swamp plantings, accurate data are needed on the content and condition of the moisture in soils. The determination of soil moisture content and moisture pressure and their relationship by two different methods show that the tensiometric method is preferable to taking a soil sample by drilling. The former is more accurate and yields results much more quickly. (Woodard-USGS)
W73-05696

OVERLAND FLOW HYDROGRAPH ANALYSIS TO DETERMINE INFILTRATION FUNCTION,
Hawaii Univ., Honolulu. Dept. of Agricultural Engineering.
I. P. Wu.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol 14, No 2, p 294-300, February 1971. 11 fig, 11 ref.

Descriptors: *Irrigation practices, *Infiltration, *Mathematical models, Percolation, Permeability, Hydraulic conductivity.
Identifiers: Overland flow.

A method is presented to determine the infiltration function. The flow pattern of surface irrigation is nonuniform, unsteady, and spatially varied, resulting from a combination of the effects of surface flow, surface roughness, and infiltration. This flow is expressed as one set of partial differential equations of the hyperbolic type: a continuity equation and an equation of motion. The method proposed uses the concept of overland-flow hydrograph. The analysis of the hydrograph provided an approximation of the infiltration expressed as a function of distance of run and time. The hydrographs also clearly showed conditions of surface flow for which mathematical equations of infiltration were derived. (Skogerboe-Colorado State)
W73-05721

VARIABLES AFFECTING A VALUES AS A MEASURE OF SOIL NITROGEN AVAILABILITY,
California Univ., Davis. Dept. of Soils and Plant Nutrition.
F. E. Broadbent.
Soil Science, Vol 110, No 1, p 19-23, July 1970. 3 fig, 4 tab, 15 ref.

Descriptors: *Soil chemistry, *Inorganic compounds, *Nitrogen, Nitrification, Radioisotopes.
Identifiers: *Soil fertility, *Nitrogen availability, *Isotopic tracers, Soil nitrogen, Applied nitrogen, Priming effect.

Tests were performed to determine the accuracy with which A-values predict nitrogen availability. The A-value is defined as the quantity of a given plant nutrient in the soil which is equivalent in availability to that of the same nutrient added as fertilizer. It was noted that values for ammonium nitrogen were higher than for nitrate at corresponding levels of application. Also, the magnitude of the A-value measured in a particular soil will be influenced by rate of nitrification. Data presented by other authors were also analyzed. (Skogerboe-Colorado State)
W73-05735

THE SOIL AS A RESOURCE RENOVATOR,
Department of Agriculture, Washington, D.C.
For primary bibliographic entry see Field 05D.
W73-05736

EFFECT OF DROUGHT ON THREE SPECIES OF RHIZOBIUM,
Dudley Coll. of Education, (England).
W. Foulds.
Plant and Soil, Vol 35, p 665-667, 1971. 1 tab, 7 ref.

Descriptors: *Soil moisture, *Drought tolerance, *Soil investigations, *Soil tests, *Soil bacteria, *Rhizosphere, Drying, Resistance, Moisture stress, Microenvironment, Root zone, Legumes, Nitrogen fixing bacteria, Soil environment, Soil microbiology.
Identifiers: *Rhizobia.

Rhizobia are not thought to survive for long periods under drought conditions, although survival by R. japonicum has been reported in soil air dried for 19 years, and by R. trifolii and R. meliloti in soil air dried for six months provided the initial

population was high. In peat cultures, R. meliloti is more tolerant of drought conditions that R. trifolii. Results are reported of experiments in which the soil populations of Rhizobia (associated with Trifolium repens (R. trifolii), Medicago lupulina (R. meliloti), and Lotus corniculatus ('Lotus' rhizobium) were subjected to severe drought by air drying the soil at 22 C. Reduction in population of Rhizobia was estimated by use of a plant-infection technique. Results indicate that the three Rhizobium species appear to be capable of survival in soil with low water content. If left for long periods in conditions of extreme drought (less than 5 percent water), however, the cells are eventually destroyed. Not all the species studied are affected to the same degree; R. trifolii was the most tolerant and R. meliloti and the 'Lotus' rhizobium about equally susceptible. (Black-Arizona)
W73-05780

WATER, SALT PATTERNS WITH DESERT DRIP IRRIGATION,
California Univ., Riverside. Citrus Research Center and Agricultural Experiment Station.
For primary bibliographic entry see Field 03C.
W73-05781

MOVEMENT OF SOIL MOISTURE UNDER TEMPERATURE GRADIENTS,
Kyushu Agricultural Experiment Station (Japan).
Y. Suzuki.
Available from NTIS, Springfield, Va., 22151 as N72-26293, Price $3.00 printed copy; $0.95 microfiche. National Aeronautics and Space Administration Technical Translation Report NASA TT-F-14291, June 1972. 19 p, 6 fig, 3 tab, 7 ref. (Translation of 'Ondo keiodoka ni okeru dojo suibun no ido,' Journal of Agricultural Meteorology of Japan, Vol 18, No 3, p 98-104, Dec., 1962.)

Descriptors: *Soil moisture, *Soil water movement, *Soil temperature, *Soil structure, Data collections, Testing procedures, Correlation analysis, Sands, Particle size, Evaporation, Condensation.
Identifiers: Soil temperature gradients, Temperature effects.

The effect of a temperature gradient on the movement and distribution of soil moisture was examined in closed column of soil for various initial water contents (1% to 7%). Water evaporating from the hotter soil moves as vapor into colder soil, where it condenses and returns as liquid when a favorable gradient of moisture has been established. Liquid flow works as a control factor and reduces the amount of net transfer due to temperature gradient. The amount of transfer of soil moisture varies with the initial water content, and for sand (particle size 0.175 to 0.5 mm) the maximum transfer of moisture from the hot to the cold end occurred at between 3.5% and 4.0% of the initial water content which is approximately one-third of the moisture equivalent. (Woodard-USGS)
W73-05791

SEASONAL IONIC FLUCTUATIONS IN A COMMUNITY,
Carleton Univ., Ottawa (Ontario). Dept. of Biology.
For primary bibliographic entry see Field 05A.
W73-05838

2H. Lakes

UPTAKE OF TOXIC WATER POLLUTANTS (PCB) BY LAKE TROUT,
Northern Michigan Univ., Marquette. Dept. of Biology.
For primary bibliographic entry see Field 05C.
W73-05201

CHEMICAL COMPOSITION OF A SALINE LAKE ON ENDERBURY ISLAND, PHOENIX ISLAND GROUP, PACIFIC OCEAN,
Geological Survey, Menlo Park, Calif.
D. W. Brown, and R. A. Gulbrandsen.
Journal of Research, U. S. Geological Survey, Vol 1, No 1, p 105-111, January - February 1973. 1 fig, 4 tab, 16 ref.

Descriptors: *Water chemistry, *Brines, *Lakes, *Atolls, Pacific Ocean, Phosphates, Gypsum, Calcium carbonate, Saturation, Saline water.
Identifiers: Guano.

Ion activity products for the dissolution of calcite, aragonite, gypsum, monetite, brushite, dolomite, magnesite, hydroxyapatite, and fluorapatite were calculated for a South Pacific guano island brine with an ionic strength of 6.4. Environmental conditions of the brine at the time of anlysis and of sampling suggest saturation with respect to calcite, aragonite, gypsum, hydroxyapatite and fluorapatite; comparison of the ion activity products and equilibrium constants shows saturation or supersaturation with respect to most minerals found in lake sediments or elsewhere on the island. The results suggest that chemical thermodynamic calculations for brines may be useful despite the many assumptions and estimations that must be made. (Knapp-USGS)
W73-05299

A NEW RAPHIDIOPSIS SPECIES (CYANOPHTYA, RIVULARIACEAE) FROM MINNESOTA LAKES,
For primary bibliographic entry see Field 05C.
W73-05368

EUTROPHICATION AS A PROBLEM IN THE FINGER LAKES,
Cornell Univ., Ithaca, N.Y. Water Resources and Marine Sciences Center.
For primary bibliographic entry see Field 05C.
W73-05379

BIOLOGY OF LARVAL SEA LAMPREYS (PETROMYZON MARINUS) OF THE 1960 YEAR CLASS, ISOLATED IN THE BIG GARLIC RIVER, MICHIGAN, 1960-1965,
Bureau of Commercial Fisheries, Marquette, Mich.
P. J. Manion, and A. L. McLain.
Great Lakes Fish Comm Tech Rep. 16 p 1-35. 1971. Illus.
Identifiers: Annual, *Big Garlic River, Catch, Lampreys, Larval, Metamorphosis, *Michigan, Petromyzon-marinus, River Sea lamprey.

The early life history of the sea lamprey, from hatching to the first capture of metamorphosed individuals, is described from observations on a known-age population isolated in a tributary of southern Lake Superior. The population had its origin in the spring of 1960, when 722 sea lampreys nearing spawning condition were introduced into the Big Garlic River, Marquette County, Michigan, a stream that had previously been free of lampreys because physical barriers prevented their upstream migration. The adults constructed 206 nests and spawned in 161 of them; an estimated 774,000 larvae were hatched. The average total lengths of larvae collected in Oct. (when yearly growth was nearly complete) in 1960-65 were 13, 39, 63, 80, 92, and 107 mm in the successive years. A specially designed inclined-plane trap, installed at the lower end of the study area to monitor the downstream movement of larval and newly metamorphosed lampreys captured 7562 larvae in 1962-65 (none in 1960-61). The annual catch increased sharply from 9 in 1962 to 370 in 1963, 2847 in 1964, and 4336 in 1965. About 90% of each annual catch was taken by June 30. Most movement was at night. A total of 5642 larvae were marked in 1962-65 by the subcutaneous injection of an insoluble dye, to study movement and distribution; 222 were recovered as larvae through 1965 (17 in the trap and 205 with an electric shocker). The recoveries of marked lampreys, the increase in density of larvae in the farthest downstream section of the study area, and the annual catches in the trap demonstrated that a large part of the population gradually shifted downstream. Many larvae were still within less than 1 km from the place of hatching, after more than 5 yr. The capture of 4 recently metamorphosed sea lampreys (2 males and 2 females), 152-172 mm long, in the fall of 1965, established the minimum age at transformation for larvae in the Big Garlic River at 5 yr. Age and length (with the exception of a possible minimum length) were determined not to be critical factors in metamorphosis. The presence of larvae 65-176 mm long (mean, 107 mm) in the river in 1965 indicated that metamorphosis of lampreys of a single year class takes place over a period of years.--Copyright 1972, Biological Abstracts, Inc.
W73-05399

PHYTOPLANKTON COMPOSITION AT LAKE DRUMMOND IN THE DISMAL SWAMP, VIRGINIA, SUMMER 1970,
Old Dominion Univ., Norfolk, Va. Dept. of Biology.
H. G. Marshall, and W. H. Poore, Jr.
Castanea. Vol 37, No 1, p 59-67. 1972. Illus.
Identifiers: Asterionella-formosa, Closterium-gracile, *Dismal swamp, Lakes, Melosira-herzogii, *Phytoplankton, Staurastrum-parasoxum, Summer, Swamp, *Virginia, *Lake Drummond.

There was little species diversity of the phytoplankton which was composed mainly of diatoms, desmids, and phytoflagellates. The dominant species were Asterionella formosa, Melosira herzogii, Closterium gracile, and Staurastrum paradoxum.--Copyright 1972, Biological Abstracts, Inc.
W73-05426

MAJOR, MINOR, AND TRACE ELEMENTS IN SEDIMENTS OF LATE PLEISTOCENE LAKE SALINE COMPARED WITH THOSE IN LAKE MICHIGAN SEDIMENTS,
Illinois State Geological Survey, Urbana.
For primary bibliographic entry see Field 02J.
W73-05481

A HYDROLOGIC DESCRIPTION OF LAKE THONOTOSASSA NEAR TAMPA, FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 07C.
W73-05486

THE MINERALOGY OF SUSPENDED SEDIMENT IN SOME ALASKAN GLACIAL STREAMS AND LAKES,
Cold Regions Research and Engineering Lab., Hanover, N.H.
For primary bibliographic entry see Field 02J.
W73-05494

RELATIONSHIP BETWEEN SUMMER FOOD OF JUVENILE SOCKEYE SALMON, ONCORHYNCHUS NERKA, AND THE STANDING STOCK OF ZOOPLANKTON IN ILIAMNA LAKE, ALASKA,
International Pacific Halibut Commission, Seattle, Wash.
For primary bibliographic entry see Field 08I.
W73-05501

PHYTOPLANKTON IN LAKE TAHOE. DEEP--LIVING POPULATIONS,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
For primary bibliographic entry see Field 05C.

W73-05557

AN ECOLOGICAL STUDY OF THE MACROPHYTIC VEGETATION OF DOODHADHARI LAKE, RAIPUR, M.P. 3 CHEMICAL FACTORS,
Government Coll. of Science, Raipur (India). Dept. of Botany.
For primary bibliographic entry see Field 05C.
W73-05559

CAUSES OF MORTALITY IN THE ENDEMIC TILAPIA OF LAKE CHILWA (MALAWI),
Malawi Univ., Limbe.
For primary bibliographic entry see Field 05C.
W73-05562

LAKE MUSSEL DISTRIBUTION AS DETERMINED WITH SCUBA,
North Dakota Univ., Grand Forks. Dept. of Geology.
A. M. Cvancara.
Ecology, Vol 53, No 1, p 154-157, 1972, Illus.
Identifiers: Anodonta grandis, Anodontoides ferussacianus, Distribution, Lakes, Lampsilis radiata Luteola, *Minnesota, *Mussel, *SCUBA.

Mussels were surveyed by SCUBA in Long Lake (47 deg 16 1/2 min N, 95 deg 17 1/2 min W), northwestern Minnesota, in 1969 along belt transects paralleling depth contours. Three species (in order of decreasing abundance)--Lampsilis radiata luteola (Lamarck, 1819), Anodontoides ferussacianus (Lea, 1834), and Anodonta grandis Say, 1829--were found at maximum depths of 9, 2, and 8 m, respectively. Mussel density decreased with depth from a maximum of 54 mussels/m2 at 1 m to 0.6 mussels/m2 at 9 m. A significant (P ± 0.05) decrease in shell height with depth was exhibited by L. radiata luteola and Anodontoides ferussacianus. Mussels occurred in lesser concentrations and at lesser depths (1 m vs. 9 m) on the northeast side of the lake where aquatic plant cover was greater. One species, L. radiata luteola, was significantly (P ± 0.05) larger on the northeast side at 1-m depth.--Copyright 1972, Biological Abstracts, Inc.
W73-05570

INVESTIGATION OF LAKE WATER QUALITY IN EASTERN SOUTH DAKOTA WITH REMOTE SENSING TECHNIQUES,
South Dakota State Univ., Brookings. Remote Sensing Inst.
For primary bibliographic entry see Field 05A.
W73-05580

THERMAL DISCHARGES INTO LAKES AND COOLING PONDS,
Argonne National Lab., Ill. Center for Environmental Studies.
For primary bibliographic entry see Field 05C.
W73-05582

THE ULTRASTRUCTURE OF THE FRUSTULES OF SOME ENDEMIC SPECIES OF DIATOMS OF YUGOSLAVIA, (L'ULTRASTRUCTURE DES FRUSTULES DE QUELQUES ESPECES ENDEMIQUES DES DIATOMEES DE LA YOUGOSLAVIE),
Sarajevo Univ. (Yugoslavia). Faculty of Natural Science.
For primary bibliographic entry see Field 05A.
W73-05669

INTERNAL UNDULAR SURGES IN SENECA LAKE: A NATURAL OCCURRENCE OF SOLITONS,
Lamont-Doherty Geological Observatory, Palisades, N.Y.
K. Hunkins, and M. Fliegel.
Journal of Geophysical Research, Vol 78, No 3, p 539-548, January 20, 1973. 10 fig, 14 ref.

Descriptors: *Lakes, *Seiches, *Surges, *Thermal stratification, Waves (Water), Thermocline, Internal waves, Interfaces, Water temperature, *New York.
Identifiers: *Seneca Lake (N Y).

During summer and fall when Seneca Lake, N. Y., is well stratified, internal surges often travel from south to north. A thermistor array was monitored at barge sites in Seneca Lake for four seasons. The isotherms are as much as 20 m deeper after the surge, which travels at a speed of 35 to 40 cm/sec. A wave train with two distinctive parts characterizes these surges. First there are a number of spatially coherent pulses with broad peaks and sharp troughs that are followed by a lower-amplitude wave train that is less coherent. The initial pulses are interpreted as the solitions of nonlinear wave theory. The trailing waves are the oscillatory tail also predicted by theory. Recent results by others have elucidated the generation and propagation of waves that have large amplitudes but that do not break. The numerical calculations for these waves explain some aspects of the internal surges in Seneca Lake. (Knapp-USGS)
W73-05677

ORGANIC CARBON IN SEDIMENTS OF LAKE GEORGE, NEW YORK: RELATION TO MORPHOLOGY OF LAKE BOTTOM, GRAIN SIZE OF SEDIMENTS, AND MAN'S ACTIVITIES,
Rensselaer Polytechnic Inst., Troy, N.Y. Lake George Water Research Center.
M. Schoettle, and G. M. Friedman.
Geological Society of America Bulletin, Vol 84, No 1, p 191-197, January 1973. 5 fig, 7 ref.

Descriptors: *Bottom sediments, *Organic matter, *Lakes, *New York, *Limnology, Decomposing organic matter, Clays, Sands, Humus, Degradation (Decomposition), Provenance, Water pollution sources, Silts, Leaves, Iron, Manganese.

Relict glacial sediment and modern sediment rich in organic matter cover the bottom of Lake George, N. Y. The relict sediment includes Pleistocene varved lake clay containing iron-manganese nodules. Sediment in the deeper parts of the lake is black, and clay and organic matter contents are high. In the shallower part of the lake, sediment is brown, usually sandy, and low in organic matter. Tree bark, spore capsules, leaves, and needles compose much of the organic matter in the sandy nearshore bottom sediments. The organic material which enters the lake (primarily in the fall) is derived from vegetation in the drainage basin. The fabric of organic matter in the deeper parts of the lake cannot be identified because of advanced decomposition. The organic matter content of the bottom sediments of the southern basin generally exceeds that of the northern basin, because pollution from permanent settlements along the shores of the southern basin accelerates accumulation of organic matter by enhancing phytoplankton productivity. (Knapp-USGS)
W73-05681

CLAY MINERALS IN RECENT SEDIMENTS OF LAKE KINNERET (TIBERIAS), ISRAEL,
Hebrew Univ., Rehovoth (Israel). Dept. of Soil Science.
For primary bibliographic entry see Field 02J.
W73-05684

WATER-QUALITY DATA FOR THE FLAMING GORGE RESERVOIR AREA, UTAH AND WYOMING, 1969-72,
Geological Survey, Salt Lake City, Utah.
For primary bibliographic entry see Field 07C.
W73-05693

EXPERIMENTAL DETERMINATION OF WIND DRAG ON AN ICE SHEET (EKSPERIMENTAL'NOYE OPREDELENIYE SILY VETRA, DEYSTVUYUSHCHEY NA LEDYANOY POKROV),
Arkticheskii i Antarkticheskii Nauchno-Issledovatelskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 02C.
W73-05712

PHOTOSYNTHETICALLY ELEVATED PH AS A FACTOR IN ZOOPLANKTON MORTALITY IN NUTRIENT ENRICHED PONDS,
Kansas Univ., Lawrence. Dept. of Systematics and Ecology.
For primary bibliographic entry see Field 05C.
W73-05840

LIFE CYCLE OF POTAMOTHRIX HAMMONIENSIS (TUBIFICIDAE) IN THE PROFUNDAL OF A EUTROPHIC LAKE,
Copenhagen Univ. (Denmark). Freshwater Biological Lab.
For primary bibliographic entry see Field 05C.
W73-05846

2I. Water in Plants

FUNCTIONAL LOADING AS A METHOD OF STUDY OF THE PLANT WATER REGIME (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Institut Fiziologii Rastenii i Agrokhimii.
S. I. Slukhai, and N. D. Stetsenko.
Fiziol Biokhim Kul't Rast. Vol 3, No 4, p 385-391. 1971. English summary.
Identifiers: Air, Leaf, *Maize-M, *Plant-water regime, Temperature.

Using multi-channel recording and dispersed analysis it was shown that during a sharp increase of insolation at the critical stage of tasseling in maize plants at 35% of soil maximum water capacity (SMWC) the limits of the regulated parameter of the leaf t deg and the algebraic temperature difference leaf-air were higher while the relative rate of water conduction by the stem was lower than at 70% of SMWC. Though the photosynthetic efficiency was lower, plant vitality was maintained. At the stage of 7-8 leaves the first 2 values were regulated better at 35% SMWC than at 70%, but the water conduction rate by the stem was the same. Maize plants, which at the stage of ear formation were put under conditions of 70% SMWC, at the stage of milk maturity did not differ from those grown with constant water supply at 70% SMWC.--Copyright 1972, Biological Abstracts, Inc.
W73-05355

CONTRIBUTION TO THE STUDY OF THE ANATOMY AND PHYSIOLOGY OF JAMBOSA VULGARIS MILL, (IN PORTUGUESE),
Universidade Federal do Espirito Santo (Brazil). Bolsista Reitoria.
Neide M. C. Lucas.
Cienc Cult. Vol 23, No 3, p 307-311. 1971. Illus. English summary.
Identifiers: Anatomy, Chlorenchyma, Collenchyma, Druses, Epidermis, Idioblasts, *Jambosa-Vulgaris-D, *Leaf blades, Palisade, Parenchyma, Physiology, Sclerenchyma, Stomata, Transpiration.

A study was made of the anatomy of the leaf blade and behavior of J. vulgaris in relation to water. The principal observations were as follows: the epidermis is glabrous, with glandular openings; paracytic 'telephone' shaped stomata occur in the abaxial epidermis; chlorenchyma is differentiated in palisade and spongy parenchyma; mechanical tissue consists of collenchyma and sclerenchyma; many druses in colorless idioblasts are present; transpiration is unrestricted in Sept. and the end of

Oct.; the slow hydroactive movements of the stomata show oscillations; and saturation deficit and cuticular transpiration values are low.--Copyright 1972, Biological Abstracts, Inc.
W73-05364

FOOD OF FEMALE MARSH KILLIFISH, FUNDULUS CONFLUENTUS GOODE AND BEAN, IN FLORIDA,
Florida State Div. of Health, Vero Beach. Entomology Research Center.
R. W. Harrington, Jr., and E. S. Harrington.
Am Midland Nat. Vol 87, No 2, p 492-502. 1972. Illus.
Identifiers: Algae, Annelids, Arachnids, Crustaceans, Female fish, *Florida, *Food (Fish), Fundulus-confluentus, Gambusia-affinis, Insect, Invertebrate, Killifish, *Marsh killifish, Mollusks, Palaemonetes, Protozoans, Species.

The food of 1945 individuals, 124 to 200 each month of the year, was analyzed. Among the 253 categories identified were: algae, vascular-plant detritus and fresh tissue; 3 orders, 6 families and 5 genera of protozoans; rotifers; a bryozoan; gastropod molluscs of 3 families, 2 genera and 1 sp; some pelecypods; polychaete annelids of 3 families, 2 genera and 1 sp., some oligochaetes; 18 families, 13 genera and 2 spp., of crustaceans, viz., cladocerans, ostracods, copepods (calanoid, cyclopoid, harpacticoid and caligoid), cheliferans, isopods, amphipods, carideans, astracurans and brachyurans; 3 orders of arachnids; diplopodans; 12 orders, 54 families and 51 genera of insects (1 ephemeropterans, 5 odonate, 3 trichopteran, 12 dipteran, 10 heteropteran and 20 coleopteran); and 3 spp. of fish mostly neonate Gambusia affinis. The total volume was 36% fishes, 21% crustaceans, 18% insects, 11% plant, 7% annelids and 7% molluscs. The breakdown for crustaceans was 9% Palaemonetes, 6% amphipods, 2% ostracods, 2% cheliferans, 1% brachyurans, 1% copepods; for insects, 12% dipterans (6% chironomids, 2% ceratopogonids, 1% stratiomyiids, 1% tipulids, 2% other families), 2% hemipterans, 2% coleopterans, 1% odonates, 1% hymenopterans; for plants, 7% fresh vascular, 3% algae, 1% vascular detritus. There was no evidence of seasonality in the taking of any item except fishes, whose consumption had a bimodal annual curve, flawed by possible sampling error as to predator size, since consumption of fishes increased with size of predator. The percentage frequencies of occurrence were 2 to 7 times the percentage volumes of the above items except copepods (34 times), ostracods (18), vascular-plant detritus (11), tipulids (0.8), fishes (0.6) and Palaemonetes (0.4). Smaller marsh killifish eat fewer Palaemonetes and fishes but not tupulids.--Copyright 1972, Biological Abstracts, Inc.
W73-05411

INFLUENCE OF AVAILABLE WATER OF SOILS ON THE CIRCULATION OF NITROGENOUS COMPOUNDS AND CAMBIAL FUNCTION IN PINUS PINASTER,
Bordeaux Univ., Talence (France). Department de Physiologie Vegetale.
R. Demounem, H. Pourbeik, T. Tamaddoni-Pourbeik, and R. David.
C R Hebd Seances Acad Sci Ser D Sci Nat (Paris). Vol 273, No 22, p 2087-2092. 1971. Illus.
Identifiers: *Cambial function, Circulation, *Nitrogen compounds, Nutrient, *Pinus-Pinaster-G, Protein synthesis, Soils.

Migration of soluble N into the bast from the soil and the wood and in the most humid sites from the aged needles occurs in early spring. Later, protein synthesis takes place in the young needles. There is a strong movement of N from the roots through the stem wood. At the beginning of the dry period, there is proteolysis in the leaves and in the terminal shoot, and a diminution of soluble N in the bast. Protein synthesis occurs in the wood of the trunk. The impoverishment of the bast in soluble N and the enrichment of the wood is concomitant with cambial slowing down. Soluble N increases in the wood and migrates from the old to the young needles. At the end of the vegetative season, there is a decrease of N in the bast tied to proteolysis and an emigration from the vegetative organs to the wood. The coordination of these phenomena with the different sites and with the rhythm of growth is described.--Copyright 1972, Biological Abstracts, Inc.
W73-05436

HORTICULTURAL SCIENCE,
J. Janick.
W. H. Freeman and Co.: San Francisco, Calif. 1972. 2nd Edition. 586p. Illus. Pr. $12.00.
Identifiers: Breeding, Control, Diseases, Genetics, Growth, *Horticultural management, Propagation, Soils, *Publications.

Part 1 deals with the biology of horticulture. The plant as a living entity is considered, including its structure, growth and development. In part 2, techniques in soil and water management, temperature and growth regulation, disease and weed control, genetics and breeding methods are considered in terms of their broad horticultural implications. Part 3 describes the industry of horticulture with emphasis on its distinguishing characteristics and special problems. Horticultural production systems horticultural crops and the esthetic aspects of horticulture are discussed.--Copyright 1972, Biological Abstracts, Inc.
W73-05512

SEASONAL AND DIURNAL CHANGES IN MOISTURE CONTENTS AND WATER DEFICITS OF ENGELMANN SPRUCE NEEDLES,
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
H. L. Gary.
Bot Gaz. Vol 132, No 4, p 327-332. 1971. Illus.
Identifiers: Deficits, Diurnal, *Moisture content, Needles, New Mexico, *Picea-Engelmanni-G, Seasonal, *Spruce-G.

Changes in moisture contents, dry matter, water components, and water deficits of 1-yr-old needles from 20-yr-old Engelmann spruce (Picea engelmanni Parry) were followed for 1 yr in northern New Mexico. Moisture percentages reached a seasonal high in March and a low before budbreak in June. The decline was associated primarily with an increase in dry matter. Dry matter then declined, while moisture percentage increased from June until early Aug. Subsequent fluctuations in dry matter and water components were minor. Water deficits were highest during the primary growing season June through Oct.--Copyright 1972, Biological Abstracts, Inc.
W73-05650

DESCRIPTION OF PHOTOSYNTHESIS WITHIN PLANT CANOPIES,
Kentucky Univ., Lexington. Dept. of Agronomy.
W. G. Duncan, and B. J. Barfield.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol 14, No 5, p 960-963, May 1971. 6 fig, 6 ref.

Descriptors: *Computer models, *Crop growth, *Photosynthesis, Energy conversion, Light, Plant physiology, Transpiration.

Various methods used to measure photosynthesis of growing crops in the field are summarized. A review of what photosynthesis is and anologies to other man made systems were made. A model for describing and determining the rate of photosynthesis was developed. Factors affecting the process are discussed. The model can be likened to a series of snapshots taken of the processes present at a given instant. When these are all put together, a good picture of the overall process is presented. No attempt was made to simulate growth. (Skogerboe-Colorado State)
W73-05732

DYNAMIC SIMULATION OF PLANT GROWTH--PART I. DEVELOPMENT OF A MODEL,
Ohio Agricultural Research and Development Center, Wooster.
R. B. Curry.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol 14, No 5, p 946-959, May 1971. 6 fig, 1 tab, 17 ref.

Descriptors: *Mathematical models, *Computer models, *Plant growth, Evapotranspiration, *Simulation analysis, Computer programs.

A computer model for plant growth was developed. Objectives were: (1) To develop a mode that is a dynamic simulation of plant growth. (2) To account for the total energy of the system. (3) To develop the program in individual parts so that as methods are improved, it can be easily updated. The model and data presented are first approximations of a possible dynamic modeling approach to the plant growth system. The program is written in continuous system modeling program language. (Skogerboe-Colorado State)
W73-05734

PLANT WATER STATUS OF APPLE TREES AND ITS MEASUREMENT IN THE FIELD: VI. DIURNAL VARIATIONS IN THE WATER POTENTIAL OF APPLE LEAVES AND FRUITS OF THREE CULTIVARS AT TWO STRESS LEVELS,
Department of Primary Industries, Applethorpe (Australia). Granite Belt Horticulture Research Station.
For primary bibliographic entry see Field 03F.
W73-05738

BIOCLIMATE, LEAF TEMPERATURE, AND PRIMARY PRODUCTION IN RED MANGROVE CANOPIES IN SOUTH FLORIDA,
San Diego State Coll., Calif. Dept. of Biology.
For primary bibliographic entry see Field 02D.
W73-05749

A SELECTED AND ANNOTATED BIBLIOGRAPHY OF UNDERSTORY-OVERSTORY VEGETATION RELATIONSHIPS,
Arizona Univ., Tucson. Dept. of Watershed Management.
For primary bibliographic entry see Field 04A.
W73-05770

INFLUENCE OF THREE CUTTING SYSTEMS ON THE YIELD, WATER USE EFFICIENCY, AND FORAGE QUALITY OF SAINFOIN,
Colorado State Univ., Fort Collins. Dept. of Agronomy.
For primary bibliographic entry see Field 03F.
W73-05771

ESTABLISHMENT AND SURVIVAL OF PASTURE SPECIES FROM SEEDS SOWN ON THE SOIL SURFACE,
Commonwealth Scientific and Industrial Research Organization, Cnaberra (Australia). Div. of Plant Industry.
P. M. Dowling, R. J. Clements, and J. R. McWilliam.
Australian Journal of Agricultural Research, Vol 22, No 1, p 61-74, 1971. 7 tab, 2 fig, 38 ref.

Descriptors: *Vegetation establishment, *Seed treatment, *Soil surfaces, *Competition, *Seed

treatment, *Application methods, *Planting management, *Soilcwater-plant relationships, *Air-earth interfaces, *Soil treatment, Legumes, Grasses, Seeds, Microenvironment, Germination, Australia, Growth chambers, Herbicides, Mulching, Absorption, Soil environment, Land reclamation, Pasture management.

Conditions for establishment of legume and grass seeds on the soil surface are more severe than those experienced by buried seeds. One important reason is the rapid fluctuation in moisture and humidity in the microenvironment of the seed at the soil-air interface, which restricts radicle penetration of the soil surface, and reduces their ability to keep pace with the receding moisture front. Previous studies of seedling establishment on non-arable land in south-eastern Australia are extended in this work. In addition, specific investigations of competition from existing vegetation, influence of shading, and effect of varying surface microtopography were made. Both field and controlled environment findings indicate that (1) the establishment and suvival of broadcasted seedlings sown on non-arable land can be significantly improved by prior treatment of the site with herbicides to reduce competition from existing vegetation, (2) providing protection for seeds by retaining dead vegetative cover, or by creating some form of surface roughness, improves establishment as it reduces desiccation and provides a more favorable moisture environment in the vicinity of the seed, (3) uptake of water by seed resting on the soil surface is enhanced by absorbed lime or bentonite coatings which, in turn, increases germination, (4) variation between species in their ability to establish on the surface suggests that the choice of more suitable species, and selection to improve their adaption, could also contribute to greater efficiency of aerial seeding. (Black-Arizona)
W73-05772

STRUCTURE AND ENERGETICS OF 3 MINNESOTA FORESTS,
Dartmouth Coll., Hanover, N.H. Dept. of Biological Sciences.
W. A. Reiners.
Ecol Monogr. Vol 42, No 1, p 71-94. 1972. Illus.
Identifiers: Detritus, Energetics, *Fen, *Forests, *Minnesota, Oak-D, Primary production, Thuja-occidentalis-G.

Three contiguous ecosystems, an upland oak forest, marginal fen, and cedar swamp, were analyzed along a gentle topographic gradient on the Anoka Sand Plain in east-central Minnesota. The organic structure and aboveground-primary productivities of these forests were compared with similar data for other natural ecosystems of the sand plain. Living, aboveground biomass totals of the oak, fen, and swamp forests were 124.6, 98.8, and 159.6 mt/ha, respectively. Aboveground, net annual productivities were 8.9, 7.1, and 10.3 mt/ha, respectively, which compared well with other forest data for the region and with a predicted value based on actual evapotranspiration. Several measures of structure were compared in the analysis. Species richness and equitability were greatest in the marginal fen where biomass and productivity were the least. Richness and equitability were lowest in the oak forest. The highest biomass-to-production ratio was found for the Thuja swamp, although it had the highest annual production. Apparently the high production in the swamp was achieved with a large mass of relatively inefficient foliage concentrated in T. occidentalis. The percentages of primary production entering detritus pathways were 52, 62, and 48 for oak, fen, and swamp, respectively. Total detritus, including dead boles, branches and forest floors, was large in relation to living biomass in all 3 forests, but was especially important in the fen and swamp systems where deep forest floors had accumulated. Total detritus was 61%, 331% and 577% of aboveground biomass in the oak, fen, and swamp, respectively. All data were produced in caloric as well as weight units.--Copyright 1972, Biological Abstracts, Inc.
W73-05775

PENETRATION OF STOMATA BY LIQUIDS. DEPENDENCE ON SURFACE TENSION, WETTABILITY, AND STOMATAL MORPHOLOGY,
Michigan State Univ., East Lansing. Dept. of Horticulture.
J. Schonherr, and M. J. Bukovac.
Plant Physiology, Vol 49, p 813-819, 1972. 9 fig, 28 ref.

Descriptors: *Plant physiology, *Stomata, *Surface tension, *Wettability, *Leaves, *Mechanical properties, Penetration, Plant morphology, Horticulture, Osmosis, Mathematical studies, Surfactants, Capillary action, Respiration, Transpiration, Absorption, Interfaces.

It is generally accepted that pure water does not enter into the intercellular space through open stomata unless external pressure is applied. Some organic liquids, however, do penetrate readily, controlled by wettability of the leaf surface, surface tension of the liquid, and stomatal morphology. The critical surface tension of the lower leaf surface of Zebrina purpusii Bruckn. was estimated to be 25 to 30 dyne/cm. Liquids having a surface tension less than 30 dyne/cm gave zero contact angle on the leaf surface and inflitrated stomata spontaneously, while liquids having a surface tension greater than 30 dyne/cm did not wet the leaf surface and failed to infiltrate stomata. Considering stomata as conical capillaries, and with liquids giving a finite contact angle, infiltration depended solely on the relationship between the magnitude of the contact angle and the wall angle of the aperture. Generally, spontaneous infiltration of stamata will take place when the contact angle is smaller than the wall angle of the aperture wall. The degree of stomatal opening was of little importance. Cuticular ledges present at the entrance to the outer vestibule and between the inner vestibule and substomatal chamber resulted in very small if not zero wall angles, and thus played a major role in excluding water from the intercellular space of leaves. The degree of stomatal opening cannot be assessed by observing spontaneous infiltration of stomata by organic liquids of low surface tension. (Black-Arizona)
W73-05778

EFFECT OF DROUGHT ON THREE SPECIES OF RHIZOBIUM,
Dudley Coll. of Education, (England).
For primary bibliographic entry see Field 02G.
W73-05780

EFFECT OF DROUGHTING AND CHILLING ON MATURATION AND CHEMICAL COMPOSITION OF TOWNSVILLE STYLO (STYLOSANTHES HUMILIS),
Commonwealth Scientific and Industrial Research Organization, St. Lucia (Australia). Cunningham Lab.
For primary bibliographic entry see Field 03F.
W73-05786

THE AQUATIC COLEOPTERA OF EAST SUSSEX,
G. N. Foster.
Entomol Gaz. Vol 23, No 1, p 25-60. 1972. Illus.
Identifiers: *Coleoptera, England, *Sussex (England).

An annotated check list of 170 spp. of Halipidae, Hygrobiidae, Dytiscidae, Gyrinidae and Hydrophilidae from various aquatic habitats in East Sussex, England is presented. The effect of stream and pond composition upon beetle distribution is analyzed.--Copyright 1972, Biological Abstracts, Inc.
W73-05816

SEASONAL IONIC FLUCTUATIONS IN A COMMUNITY,
Carleton Univ., Ottawa (Ontario). Dept. of Biology.
For primary bibliographic entry see Field 05A.
W73-05838

ECOLOGICAL CHARACTERISTICS OF ARISTIDA LONGISETA AND AGROPYRON SPICATUM IN WEST-CENTRAL IDAHO,
Soil Conservation Service, Pocatello, Idaho.
G. R. Evans, and E. W. Tisdale.
Ecology, Vol 53, No 1, p 137-142, 1972, Illus.
Identifiers: *Agropyron-spicatum-M, *Aristida-longiseta-M, Ecological studies, Grazing, *Idaho, Roots, Temperature.

Germination requirements, root development, phenology, and the effects of moisture-saturated soils were studied in Aristida longiseta and Agropyron spicatum. Agropyron germinated well at temperatures of 20 deg-22 deg C, but Aristida showed little response until temperatures were increased to 40 deg C. Prior stratification at 0 deg C had no appreciable effect on germination of either species. Rapid primary root elongation enabled Aristida to establish itself in droughty habitats, but saturated soils strongly inhibited its growth. In the field A. longiseta starts growth late in the spring, develops at a rapid rate, and flowers 10 days later than A. spicatum. The seed of Aristida matures slowly and is shed in Sept. Fall regrowth, which occurs normally in A. spicatum, is rare in A. longiseta. The hypothesis is developed that excessive grazing has so reduced the abundance of A. spicatum that A. longiseta has been able to replace it and form long-lived communities.--Copyright 1972, Biological Abstracts, Inc.
W73-05845

2J. Erosion and Sedimentation

FILLED INTERGLACIAL VALLEYS AT THE SOUTH END OF CAYUGA LAKE NEAR ITHACA, NEW YORK,
Cornell Univ., Ithaca, N.Y. Water Resources and Marine Sciences Center.
For primary bibliographic entry see Field 02C.
W73-05204

MICA AND SHELL AS INDICATORS OF ENERGY LEVEL AND DEPOSITIONAL REGIME ON THE NIGERIAN SHELF,
Ife Univ. (Nigeria). Dept. of Geology.
O. S. Adegoke, and D. J. Stanley.
Marine Geology, Vol 13, No 5, p M61-M66, December 1972. 2 fig, 10 ref.

Descriptors: *Sedimentation, *Sediment transport, *Deltas, *Sands, Depostion (Sediments), Mineralogy, Sedimentation rates, Littoral drift, Ocean currents, Waves (Water), Surf, Oceanography, Tidal effects.
Identifiers: Nigeria.

The recent sediments on the Nigerian Shelf are derived largely from the Niger and Benue Rivers and distributed by the deep Guinea Current and a complex series of wave- and tide-generated shallow, long-shore currents. The distribution of sand-size mica flakes and total shell counts were used to recognize energy levels and to delineate zones of by-passing and modern terrigenous deposition in a regressive deltaic setting. Since the inception of the modern Niger Delta during the Cretaceous, sediment supply has dominated over subsidence and base level changes. The long-term result of sedimentation has produced a steady southward progradation of the deltaic wedge. Sediments are dispersed by the combined effect of major deep currents, and opposed by the wave- and tide-

generated longshore currents. Mica, transported from the geologically complex hinterland into the turbid, high-energy coastal zone, is effectively winnowed seaward by current action. It bypasses the clean sand and silt littoral and inner delta-front platform and is selectively deposited with finer interbedded clayey silt and fine sand in deeper water. The zone of mica abundance on the outer delta-front platform, prodelta slope and inner open shelf defines the area of predominant accumulation of fluvially derived clastics. This belt coincides with the area of decreasing energy levels. The isopleths for total shell also support these inferences. The coincidence of the high shell and low mica isopleths is significant. Both define the present terrigenous depositional boundary. (Knapp-USGS)
W73-05308

MODERN TEMPERATE-WATER AND WARM--WATER SHELF CARBONATE SEDIMENTS CONTRASTED,
Louvain Univ. (Belgium). Institut de Geologie.
A. Lees, and A. T. Buller.
Marine Geology, Vol 13, No 5, p M67-M73, December 1972. 3 fig, 14 ref.

Descriptors: *Sediments, *Carbonates, *Continental shelf, *Sedimentology, Carbonate rocks, Sedimentation, Distribution patterns, Particle size, Particle shape, Algae, Coral, Salinity, Water temperature.

Carbonates described in publications on modern, marine, carbonate sands in 78 shelf areas between the equator and latitudes 60 deg S and 60 deg N are reviewed. Two major associations of skeletal grains are recognized: one (chlorozoan) is almost entirely restricted to warm, tropical waters; the other (foramol) is characteristic of temperate water but also extends well into the tropics. Non-skeletal grains are largely restricted to warm-water shelf environments with the chlorozoan association, but pellets can also occur with the foramol association in areas near to the chlorozoan/foramol boundary. Annual minimum and mean water temperatures appear to be major factors limiting the development of the chlorozoan association, but the distributions of the skeletal associations cannot be explained in terms of temperature alone. (Knapp-USGS)
W73-05309

THE PARTICLE-SIZE DISTRIBUTION OF QUARTZ IN SOME NORTH ATLANTIC DEEP--SEA SEDIMENTS,
Liverpool Univ. (England). Dept. of Oceanography.
A. I. Beltagy, R. Chester, and R. C. Padgham.
Marine Geology, Vol 13, No 5, p 297-310, December 1972. 1 fig, 9 tab, 12 ref.

Descriptors: *Bottom sediments, *Atlantic Ocean, *Quartz, *Particle size, *Provenance, Sediment transport, Sedimentation, Sedimentology, Distribution patterns, Clays, Winds, Currents (Water).

The distribution of quartz was investigated in carbonate-free deep-sea sediments in the Equatorial and Mid-Latitude regions of the North Atlantic Ocean. The distribution of quartz in the two regions is characteristically different. Mid-Latitude deep-sea sediments contain an average of 21% quartz compared to an average of 11% in the Equatorial deep-sea sediments. The mid-Latitude sediments also contain a much higher proportion of larger-sized quartz than those of the Equatorial region. A specific pattern in the distribution of quartz in the Equatorial region is evidenced in a decrease in both total quartz and in the proportion of larger-sized quartz westwards from the African mainland to beyond the mid-Atlantic Ridge. This distribution is caused by eolian transport by the northeast trade winds. No specific patterns are apparent in the distribution of quartz in the mid-Latitude deep-sea sediments. This is probably due to the quartz being brought into this region by a variety of transport mechanisms. All the deep-sea sediments contain more quartz in their coarse than in their fine fractions. For example, the greater than 8 micrometer fractions of the sediments contain about 50% quartz, whereas the less than 2 micrometer fractions contain only about 10% quartz. (Knapp-USGS)
W73-05310

INFLUENCE OF GROUNDING ICE ON THE ARCTIC SHELF OF ALASKA,
Geological Survey, Menlo Park, Calif.
E. Reimnitz, P. Barnes, T. Forgatsch, and C. Rodeick.
Marine Geology, Vol 13, No 5, p 323-334, December 1972. 4 fig, 6 ref.

Descriptors: *Bottom sediments, *Continental shelf, *Ice, *Sedimentary structures, *Geomorphology, Sediment transport, Erosion, Sea ice, Icebergs, Sedimentology, Topography.

Alaska's Beaufort Sea shelf is characterized by small-scale relief with an average amplitude of 1-2 m and wavelength of 50-100 m. Diving observations confirm that much of the bottom roughness reflects the action of grounded ice. Except for areas in the shadow of islands, bars, and offshore bathymetric highs, the entire shelf surface from the beach to at least the 75-m contour is now or has been modified by ice gouging. Ice contact with the bottom is more common, and rates of sedimentation higher on the inner shelf than on the outer shelf; the density of gouge features is about equal in both areas. Therefore, the chances are that an area of gouging on the inner shelf contains younger gouges than a similar area on the outer shelf. When ice grounds, it becomes an important agent in the sedimentary and morphologic environment of the Arctic shelf, directly by deforming bottom deposits and secondarily be affecting the current regime near the sediment/ice contact. While bulldozing action and rafting do not seem to contribute significantly to the direct transport of sediment, resuspension of bottom material during bulldozing, which makes sediment available for transport, may be significant. (Knapp-USGS)
W73-05311

SWASH-ZONE COMPETENCY OF GRAVEL--SIZE SEDIMENT,
Maine Univ., Portland. Dept. of Physical Sciences and Engineering.
I. D. Novak.
Marine Geology, Vol 13, No 5, p 335-345, December 1972. 7 fig, 2 tab, 19 ref.

Descriptors: *Sediment transport, *Surf, *Gravels, *Beaches, *Beach erosion, Waves (Water), Ocean waves, Maine, Sedimentology, Geomorphology.

On Broad Cove Beach, Appledore Island, Maine, swash velocities ranging from 6.37 to 7.96 ft/sec move particles with intermediate diameters of 0.24 to 0.36 ft. Mean breaker heights range from 0.30 to 0.97 ft. The particle-size and velocity data for the swash-zone show a very good fit with the theoretical predictions made by the Hjulstrom curve for streams. It is concluded that the Hjulstrom curve is a useful predictor of swash competency on gravel beaches. The greater energy of larger waves allows their swash to extend further up the beach. Similarly, because of their greater potential energy higher breakers result in faster swash velocities. A plot of significant breaker height versus significant swash velocity confirms this relationship for Broad Cove Beach. (Knapp-USGS)
W73-05312

GIBBSITE IN WEATHERED GRANITIC ROCKS OF ALABAMA,
Geological Survey of Alabama, University.
O. M. Clarke, Jr.
Southeastern Geology, Vol 14, No 4, p 203-212, December 1972. 3 fig, 2 tab, 15 ref.

Descriptors: *Weathering, *Clay minerals, *Soil formation, *Saprolites, Mineralogy, Clays, Alabama, Residual soils, Kaolinite, Granites.
Identifiers: *Gibbsite.

Gibbsite, which is a product of humid tropical weathering, occurs in saprolite of granitic rocks in Alabama, although the climate today is more temperate than tropical. The gibbsite may be a relic mineral of past weathering in a climate that was warmer and more humid than the current climate. Plagioclase feldspar has altered to gibbsite, whereas orthoclase feldspar, subjected to the same weathering, has altered to kaolinite. Biotite has altered to kaolinite, but it may have passed through an intermediate clay-mica (illiite) and interlayered illite-vermiculite stage. The occurrence of gibbsite is related to topography. It occurs in the upland soils of the Ashland and Opelika Plateaus, and it does not occur in substantial amounts of soils on valleys and terraces of Pleistocene and Holocene age. The uplands containing gibbsite are well drained, and silica leached from quartz and other silicates has been removed from the system; with poor drainage, gibbsite is resilicated to kaolinite. In poorly drained areas, both plagioclase and orthoclase alter to kaolinite. (Knapp-USGS)
W73-05313

EFFECTS OF SEDIMENT ON WATER QUALITY,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 05B.
W73-05315

SEDIMENT-WATER INTERACTIONS,
Illinois Univ., Urbana. Dept. of Agronomy.
For primary bibliographic entry see Field 05B.
W73-05316

GEOMORPHOLOGY AND QUATERNARY HISTORY OF THE MACKENZIE RIVER VALLEY NEAR FORT GOOD HOPE, N.W.T., CANADA,
British Columbia Univ., Vancouver. Dept. of Geography.
J. R. Mackay, and W. H. Mathews.
Canadian Journal of Earth Sciences, Vol 10, No 1, p 26-41, January 1973. 9 fig, 2 tab, 19 ref.

Descriptors: *Geomorphology, *Canada, *Paleohydrology, Topography, Erosion, Glaciers, Permafrost, Mass wasting, Valleys, Glacial drift, Alluvium, Glacial sediments, Glaciation.
Identifiers: *Mackenzie River (Canada).

The Mackenzie River valley has a sharp change in geomorphic character at The Ramparts, a postglacially developed rock-walled canyon near Fort Good Hope, N.W.T., Canada. Upstream for at least 70 km the river is cut into late-glacial and early postglacial lacustrine, deltaic, and floodplain sediments with radiocarbon dates of 11,000 to 11,500 years. These sediments are overlain by peat dating back 6120 radiocarbon years. Downstream the river reoccupies, for more than 350 km, a Pleistocene channel containing glacial and fluvial sediments yielding only dates beyond the range of carbon dating. Abandoned channels west of The Ramparts record the overflow, in early postglacial time, from a rock-rimmed lake athwart the newly developed Mackenzie drainage. The deepest of the channels, believed to have been abandoned in mid-postglacial time, contained a major waterfall with its plunge-pool floor close to present sea level. Erosion continues along the Mackenzie River above The Ramparts but some aggradation occurs below it. Permafrost thaw and heavy rainfall con-

tribute to landsliding along the river banks in both segments. (KnappiUSGS)
W73-05317

POSTGLACIAL RATES OF DENUDATION BY SOIL MOVEMENT, FREE FACE RETREAT AND FLUVIAL EROSION, MONT ST. HILAIRE, QUEBEC,
McGill Univ., Montreal (Quebec). Dept. of Geological Sciences.
A. J. Pearce, and J. A. Elson.
Canadian Journal of Earth Sciences, Vol 10, No 1, p 91-101, January 1973. 1 fig, 3 tab, 30 ref.

Descriptors: *Geomorphology, *Canada, *Mass wasting, *Erosion, *Erosion rates, Data collections, Glacial sediments, Topography, Talus, Solifluction, Degradation (Slope).
Identifiers: Mont St. Hilaire (Quebec).

Average rates of denudation over periods ranging from 11,800 to 12,800 years at 2 study areas on Mont St. Hilaire, Quebec are: soil creep and slopewash, 13.0 cu m per sq km per yr and 17.7 cu m per sq km per yr; free face retreat, 40.2 cu m per sq km per yr and 18.4 cu m per sq km per yr; and fluvial denudation, 77.8 cu m per sq km per yr and 125.4 cu m per sq km per yr. The rates of fluvial denudation are lower by a factor of one-half than published short term fluvial denudation rates in areas of similar relief and climate, and are similar to the lowest rates recorded in Spitsbergen, northern Sweden, and in the Yukon Territory. The geomorphic history of Mont St. Hilaire and the low rates of denudation together indicate that existing slope and valley forms cannot be explained adequately by present processes. Talus accumulation has obscured some Pleistocene features. (Knapp-USGS)
W73-05318

LONGSHORE DRIFT, SUBMARINE CANYONS, AND SUBMARINE FANS IN DEVELOPMENT OF NIGER DELTA,
Toronto Univ. (Ontario). Dept. of Geology.
For primary bibliographic entry see Field 02L.
W73-05324

BRISTOL BAY: MODEL CONTEMPORARY GRADED SHELF,
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 02L.
W73-05325

LATE-STAGE DEHYDRATION IN DEEPLY BURIED PELITIC SEDIMENTS,
Yale Univ., New Haven, Conn. Dept. of Geology and Geophysics.
E. A. Perry, Jr., and J. Hower.
American Association of Petroleum Geologists Bulletin, Vol 56, No 10, p 2013-2021, October 1972. 8 fig, 10 ref. NSF Grants GA 1413, GA 24155, and GA 1269.

Descriptors: *Diagenesis, *Clays, *Bottom sediments, Mineralogy, Clay minerals, Water chemistry, Pore water, Connate water, Sedimentation, X-ray diffraction.

Late-stage dehydration of shales containing montmorillonite or highly expandable illite-montmorillonite results from the conversion of montmorillonite to illite layers, thus removing interlayer water. This conversion involves interlayer potassium fixation and is a result of ionic substitution within the montmorillonite alumino-silicate layer. Therefore, the rate at which dehydration takes place should be dependent on the chemical conditions of diagenesis, particularly pore-water composition. Detailed X-ray diffraction studies of cuttings from several gulf coast wells were used in a quantitative interpretation of late-stage dehydration of shales. Late-stage dehydration begins in these samples at a depth of 6,000 to 8,000 ft and continues over an interval of 4,000 to over 10,000 ft. Dehydration rates reach maxima at the very inception of diagenesis and very near its close, when new illite layers are introduced in an ordered fashion. At the close of the diagenetic reaction the illite-montmorillonite still contains about 20% hydrated layers which persist to total depth in all wells studied. (Knapp-USGS)
W73-05326

GEOMORPHIC REGIMEN OF SMALL WATERSHEDS IN LOESS, TAMA COUNTY, IOWA,
Iowa State Univ., Ames. Dept. of Agronomy.
For primary bibliographic entry see Field 02A.
W73-05328

INDEX OF WATER-QUALITY STATIONS, WATER YEAR 1972.
Geological Survey, Washington, D.C. Water Resources Div.
For primary bibliographic entry see Field 07C.
W73-05336

TEXAS GULF COAST SEDIMENTS AND WATER QUALITY MANAGEMENT,
Texas A and M Univ., College Station. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05G.
W73-05444

TEXTURAL INDICATORS OF SEDIMENT DISPERSION IN THE NORTHERN CHANNEL ISLAND PASSAGES, CALIFORNIA CONTINENTAL BORDERLAND,
University of Southern California, Los Angeles. Dept. of Geology.
For primary bibliographic entry see Field 02L.
W73-05474

SEDIMENTATION PATTERNS IN THE BAY OF FUNDY AND MINAS BASIN,
Bedford Inst. Dartmouth (Nova Scotia). Atlantic Oceanographic Lab.
For primary bibliographic entry see Field 02L.
W73-05476

A MATHEMATICAL MODEL OF THE EFFECT OF A TIDAL BARRIER ON SILTATION IN AN ESTUARY,
Hydraulics Research Station, Wallingford (England).
For primary bibliographic entry see Field 02L.
W73-05477

SLOPE STABILITY IN TROPICALLY WEATHERED DIORITE,
Acres International Ltd., Niagara Falls (Ontario).
For primary bibliographic entry see Field 08E.
W73-05479

SEDIMENT DISTRIBUTION IN THE OCEANS: THE ATLANTIC,
Lamont-Doherty Geological Observatory, Palisades, N.Y.
M. Ewing, G. Carpenter, C. Windisch, and J. Ewing.
Geological Society of America Bulletin, Vol 84, No 1, p 71-87, January 1973. 9 fig, 1 tab, 38 ref.

Descriptors: *Bottom sediments, *Distribution patterns, *Atlantic Ocean, Sounding, Seismic studies, Ocean circulation, Sedimentation, Provenance, Deposition (Sediments).

An isopach map was constructed using seismic reflection and refraction data from about 750,000 km of traverse in the Atlantic Ocean. Sediment distribution is locally and regionally complex but is largely controlled by sea-floor spreading and proximity to continental sources. The thinnest sediments are confined to the axial zone of the mid-Atlantic ridge primarily because of the youth of this region. Sediments progressively thicken down the flanks and into the basins--a pattern in accord with sea-floor spreading theories. Average sediment thickness is about 1.0 km for the North Atlantic and about 0.7 km for the South Atlantic, a difference fundamentally attributed to the relative youth of the southern basin. Sediment thickness in the eastern basins is roughly 65% of that in the western basins and is largely the result of differences in oceanic circulation, glaciation, and continental drainage patterns. Present-day areas of low biological productivity apparently have prevailed for a considerable period of time. (Knapp-USGS)
W73-05480

MAJOR, MINOR, AND TRACE ELEMENTS IN SEDIMENTS OF LATE PLEISTOCENE LAKE SALINE COMPARED WITH THOSE IN LAKE MICHIGAN SEDIMENTS,
Illinois State Geological Survey, Urbana.
J. C. Frye, and N. F. Shimp.
Illinois Geological Survey Environmental Geology Note, No 60, January 1973. 14 p, 2 fig, 5 tab, 14 ref.

Descriptors: *Sedimentology, *Chemical analysis, *Lake Michigan, *Correlation analysis, *Glacial sediments, Lakes, Sampling, Data collections, Chemical properties, Trace elements, Evaluation.
Identifiers: *Lake Saline (Ill).

One approach to obtaining data on chemical background extending into Pleistocene time is to study deposits of a glacially fed lake that existed beyond the limit of Wisconsinan glaciers and received sediments during the times that glaciers occupied the basin of Lake Michigan. One such lake, now called Lake Saline, once existed in southeastern Illinois during the Wisconsinan Stage. The average concentrations of major elements, organic carbon, and clay-size material in Lake Saline are very similar to those of Lake Michigan sediments (top and 15 to 100 cm intervals). In contrast, the more weathered Lake Saline deposits (overwash) and Farmdale Soil are depleted in carbonates. Despite the excellent relation between major elements and stratigraphic units in the Lake Saline sequence, no such correlation is evident for the trace elements. Apparently, weathering of the Pleistocene deposits had little effect upon trace element concentrations. Therefore, trace elements cannot be used as indicators for the Lake Saline sediments in stratigraphic interpretations. (Woodard-USGS)
W73-05481

THE MINERALOGY OF SUSPENDED SEDIMENT IN SOME ALASKAN GLACIAL STREAMS AND LAKES,
Cold Regions Research and Engineering Lab., Hanover, N.H.
A. R. Tice, L. W. Gatto, and D. M. Anderson.
Research Report 305, December 1972. 10 p, 2 fig, 2 tab, 11 ref.

Descriptors: *Mineralogy, *Sediments, *Surface waters, *Alaska, Correlation analysis, Geology, Chemical analysis, X-ray diffraction, Sediment transport, Suspended solids, Weathering, Streams, Lakes, Geochemistry.
Identifiers: Glacial streams.

Suspended sediments were collected from glacial streams and lakes in southern and central Alaska to determine if any physical or chemical weathering had occurred within them. The mineralogical composition and the major constituents were determined using X-ray diffraction. In almost all cases the composition of the samples paralleled

that of the native parent materials, indicating that no chemical changes had occurred in the fine suspended material. (Woodard-USGS)
W73-05494

OPERATION OF THE NEWBURGH LOCK AND DAM, NEWBURGH, INDIANA.
For primary bibliographic entry see Field 06E.
W73-05592

COOPERATIVE GULF OF MEXICO ESTUARINE INVENTORY AND STUDY, LOUISIANA: PHASE III, SEDIMENTOLOGY,
Louisiana Wildlife and Fisheries Commission, New Orleans.
For primary bibliographic entry see Field 02L.
W73-05673

ORGANIC CARBON IN SEDIMENTS OF LAKE GEORGE, NEW YORK: RELATION TO MORPHOLOGY OF LAKE BOTTOM, GRAIN SIZE OF SEDIMENTS, AND MAN'S ACTIVITIES,
Rensselaer Polytechnic Inst., Troy, N.Y. Lake George Water Research Center.
For primary bibliographic entry see Field 02H.
W73-05681

HYDRAULIC DRAG: A MEANDER-INITIATING MECHANISM,
Herbert H. Lehman Coll., Bronx, N.Y. Dept. of Geology and Geography.
For primary bibliographic entry see Field 02E.
W73-05682

CLAY MINERALS IN RECENT SEDIMENTS OF LAKE KINNERET (TIBERIAS), ISRAEL,
Hebrew Univ., Rehovoth (Israel). Dept. of Soil Science.
A. Singer, M. Gal, and A. Banin.
Sedimentary Geology, Vol 8, No 4, p 289-308, December 1972. 11 fig, 4 plate, 2 tab, 28 ref.

Descriptors: *Clay minerals, *Bottom sediments, *Lakes, Provenance, Mineralogy, Carbonates, Kaolinite, Water chemistry, Particle size.
Identifiers: *Lake Kinneret, *Israel.

Mineralogical, chemical and granulometric data were collected on a large number of samples of recent sediments from the bottom of Lake Kinneret (Lake Tiberias), Israel, and a semi-quantitative mineralogical characterization of the fine-size fraction was conducted. Carbonate minerals constitute on the average 21.9% of the fraction smaller than 2 microns. The noncarbonate fraction contains mainly clay minerals, specifically smectite (average content 69.0% of this fraction), kaolinite (18.2%) and palygorskite (9.0%). Quartz is also present but in minor quantities (3.6%). Most of the carbonates are of endogenic source, but the origin of the clay minerals is mostly detrital and represents the geological and pedological composition of the lake's watershed area. (Knapp-USGS)
W73-05684

TIDAL-FLAT SEDIMENTATION AT COOLEY LANDING, SOUTHWEST SAN FRANCISCO BAY,
California Univ., San Francisco. Dept. of Geology.
For primary bibliographic entry see Field 02L.
W73-05685

CLAY MINERALS IN CARBONATE RESERVOIR ROCKS AND THEIR SIGNIFICANCE IN POROSITY STUDIES,
Dalhousie Univ., Halifax, (Nova Scotia). Dept. of Geology.
K. Aoyagi, and G. V. Chilingarian.
Sedimentary Geology, Vol 8, No 4, p 241-249, December 1972. 5 fig, 15 ref.

Descriptors: *Porosity, *Aquifer characteristics, *Clay minerals, *Diagenesis, Sedimentology, Carbonate rocks, Limestones, Dolomite, Kaolinite, Mineralogy, Oil reservoirs, Sedimentary rocks.

Neogene calcareous rocks of Akita, Japan, consist mainly of dolomitic clayey-siliceous marls, derived from opaline skeletal debris of microscopic organisms. The carbonate rocks of Windsor Group, Nova Scotia, Canada, which include both dolostones and limstones, originated from biogenic carbonate debris and were deposited in inner-shelf to shoal environments. Grain density is high in carbonate rocks containing kaolinite, relatively low in montmorillonite-bearing rocks, and low in carbonates poor in clay-minerals content. Generally, absolute porosity of montmorillonite-bearing carbonate rocks in much higher than that of carbonate rocks in kaolinite and carbonate rocks poor in clay minerals. Kaolinite-containing carbonate rocks exhibit much higher grain density than rocks containing montmorillonite clay or those devoid of clay minerals. This could be explained by possible reaction between calcite and some magnesium-bearing clays, which would give rise to dense dolomite and kaolinite. Widely dispersed clay minerals (especially montmorillonite) present as cement within the pore spaces of lithified sediments could hold relatively large amounts of interlayer and adsorbed water and thus resist compaction. This may explain why montmorillonite-bearing carbonates commonly exhibit higher porosity. (Knapp-USGS)
W73-05686

ANALYSIS OF SEDIMENT SHEAR STRENGTH AT VARYING RATES OF SHEAR,
Naval Academy, Annapolis, Md.
For primary bibliographic entry see Field 08G.
W73-05694

SUBMARINE HOT SPRINGS AS A SOURCE OF ACTIVE RIDGE SEDIMENTS,
Rosenstiel School of Marine and Atmospheric Science, Miami, Fla.
K. Bostrom, B. Farquharson, and W. Eyl.
Chemical Geology, Vol 10, No 3, p 189-203, November 1972. 11 fig, 2 tab, 74 ref.

Descriptors: *Water chemistry, *Leaching, *Sedimentation, Distribution patterns, Hot springs, Geochemistry, Iron, Manganese, Carbonates, Strontium, Trace elements.

Shallow hydrothermal leaching of basalt is shown to be the source of submarine ridge sediments by distribution of the elements Fe and Mn, Sr-isotopes, and inorganic deep sea carbonates in sediments. Distribution of U isotopes and abundances of U, As, B, Hg, Cd, Ba, Pb, Ag, Sc and rare earths in sea water, basalts and active ridge sediments suggest additional sources probably associated with the degassing of the earth's mantle in conjunction with the differentiation of pyrolite in areas of mantle upwelling under active ridges. (Knapp-USGS)
W73-05697

BOTTOM SEDIMENT DISTRIBUTION IN CERTAIN INSHORE WATERS OF HONG KONG,
Hong Kong Univ. Dept. of Physics.
For primary bibliographic entry see Field 02L.
W73-05698

DISTRIBUTION OF SOME TRACE ELEMENTS IN JURASSIC SEDIMENTS OF THE DNIEPER--DONETS BASIN (O RASPREDELENII NEKOTORYKH MALYKH ELEMENTOV V YURSKIKH OTLOZHENIYAKH DNEPROVSKO--DONETSKOY VPADINY),
N. Ye Kanskiy.
Akademiya Nauk SSSR Doklady, Vol 198, No 4, p 936-939, 1971. 2 tab, 4 ref.

Descriptors: *Geochemistry, *Trace elements, *Sedimentary rocks, *Sediments, Clays, Marl, Strontium, Manganese, Nickel, Copper, Chromium, Titanium, Distribution.
Identifiers: *USSR, *Dnieper River, *Donets River, *Jurassic period, Barium, Vanadium, Zirconium, Siltstones, Diastrophism.

The distribution of barium, strontium, manganese, vanadium, nickel, copper, chromium, zirconium, and titanium was investigated in Middle and Upper Jurassic sandy, silty, clayey, marly, and carbonate rocks of the Dnieper-Donets basin. The manganese concentration in rocks increases gradually with decrease in rock particle size and reaches a peak in carbonate rocks. The strontium content increases from sandy rocks to marl, where it reaches a peak, and then decreases in carbonate rocks. Barium and nickel concentrations vary widely, although they generally tend to decrease from sandy to carbonate rocks and are intermediate in clay and marl. The concentrations of vanadium, copper, chromium, zirconium, and titanium tend to increase sharply from sandy rocks to clay, where they are maximum, and then decrease appreciably in carbonate rocks. The average concentrations of trace elements for the Jurassic on the whole have, after smoothing, an ordered type of distribution, particularly explicit for the pairs zirconium and titanium, chromium and copper, and vanadium and nickel. (Josefson-USGS)
W73-05700

DETERMINATION OF OXIDATION-REDUCTION POTENTIAL OF MUDDY SEDIMENTS IN ADOIKE POND, (IN JAPANESE),
Kagawa Univ., Takamatsu (Japan). Dept. of Agricultural Chemistry.
For primary bibliographic entry see Field 05B.
W73-05737

GEOMORPHOLOGY OF THE MIDDLE LUNI BASIN OF WESTERN RAJASTHAN, INDIA,
Central Arid Zone Research Inst., Jodhpur (India).
S. Singh, S. Pandey, and B. Ghose.
Annals of Arid Zone, Vol 10, No 1, p 1-14, March 1971. 1 fig, 3 tab, 18 ref.

Descriptors: *Geomorphology, *Basins, *Arid lands, *Terrain analysis, *Sedimentary basins (Geologic), *Fluvial sediments, Alluvial fans, Erosion, Geological surveys, Hydrogeology, Sedimentology, Rivers, Drainage patterns (Geologic), Dunes, Ephemeral streams.
Identifiers: *Rajasthan, India.

In the arid Western Rajasthan the Luni is the only important river which drains into the Rann of Kutch. The bed of this river remains dry except during the rainy season when flash flows take place for a few days. The Luni and its tributaries have built up the plain features except for a few remnants of old rocks. A composite geomorphological study is presented of landforms (of 15,222 sq. km) falling in the middle part of the Luni Basin, compiled from detainled studies of landforms using aerial photointerpretation and field traverses of various Panchayat Samiti Blocks within this region. The region consists of 11 geomorphic units, the features being products of both fluvial as well as aeolian actions. Groundwater conditions are favorable in piedmant plains, recent flood plains, eroded rocky surfaces, Siwana alluval plain and Kundal-Raminia alluvial plain. Well depths vary from 15 to 21 m. in these units. Drainage patterns developed in this region are linear, sub-paralled, sub-dendritic and radial. The largest concentration of streams is in the piedmont zone where the basins of 4th order are found and the lowest number of the streams is found in Pachpadra salt basin and undulating alluvial plains with sandy hummocks. Discussion includes origin and description of sand dunes, and lists conserva-

tion measures used to control wind and water erosion. (BlackoArizona)
W73-05774

A METHOD FOR MEASURING SOIL EROSION AND DEPOSITION WITH BETA PARTICLE ATTENUATION,
Colorado State Univ., Fort Collins. Dept of Radiology and Radiation Biology.
A. W. Alldredge, and F. W.Whicker.
Journal of Range Management, Vol 25, No 5, p 393-398, Sept., 1972. 4 fig, 4 tab, 13 ref.

Descriptors: *Measurement, *Soil erosion, *Deposition (Sediments), *Radioactivity techniques, *Land management, Instrumentation, Semiarid climates, Environmental effects, Fluctuations, Strontium, *Colorado, Depth, Grasslands, Soil types, Grazing, Summer, Soil moisture, Limiting factors, Frost.
Identifiers: *Beta particle attenuation, Geiger counter, Sensitivity.

The impact of management practices upon soil fluctuations requires measurement. A method involving strontium-90 beta particle attenuation was developed and applied on the U.S. International Biological Program Grassland Biome Site at the Central Plains Experimental Range near Nunn, Colorado, to measure soil depth fluctuations in a relatively undistrubed shortgrass plains ecosystem. A sealed strontium-90 source, located below ground level, measures soil erosion and deposition by observed fluctuations in detected count rates using a portable Geiger Mueller counting system. Quantitative measurements of soil depth fluctuations in amounts considerably less than one millimeter and over a period of several weeks are possible. The method is applied in six soil series under heavy, moderate and light summer grazing treatments. The attenuation method is sensitive to soil water content less than two percent. Frost heaving of nails is recognized as a potential problem. (Popkin-Arizona)
W73-05782

CAVE DEVELOPMENT DURING A CATASTROPHIC STORM IN THE GREAT VALLEY OF VIRGINIA,
Massachusetts Univ., Amherst. Dept. of Geology.
D. O. Doehring, and R. C. Vierbuchen.
Science, Vol 174, No 4016, p 1327-1329, December 14, 1971. 3 fig, 8 ref.

Descriptors: *Streamflow, *Caves, *Sediment transport, *Sediment distribution, *Underground streams, *Virginia, Storms, Rainfall, Runoff, Floods, Water levels, Hydrologic data, Limestones, Particle size, Data collections.
Identifiers: *Cave Springs Cave (Va).

Observations made before and after a catastrophic storm in Virginia support the conclusion that caves receiving storm recharge may be significantly developed in the vadose zone by the processes of mass transfer. On August 17, 1969, Hurricane Camille dropped 25 to 28 inches of rainfall in 8 hours in parts of Virginia. The maximum rainfall has a return period well in excess of 1000 years. The hydrology of a stream was studied in Cave Springs Cave, about 1 mile northwest of Lexington, Virginia, in a karst terrain underlain by the New Market and Lincolnshire formations. The stream flows through approximately 2000 feet of the cave's passageways. Before the storm, the stream has a maximum depth of 2 to 3 feet, had an average depth of less than a foot, and carried a load consisting predominantly of mud containing some well-rounded chert pebbles. The stream depth increased more than 10 ft during the storm, causing changes in the streambed. Limestone was a major constituent of the alluvium after the storm. At one location a terrace deposit approximately 5 feet thick and 25 feet wide by 45 feet long was deposited. (Woodard-USGS)
W73-05798

UNCONSOLIDATED MATERIALS, HARTFORD NORTH QUADRANGEL, CONNECTICUT,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W73-05803

2K. Chemical Processes

IMPROVED GAS CHROMATOGRAPHIC METHOD FOR FIELD MEASUREMENT OF NITROUS OXIDE IN AIR AND WATER USING A 5A MOLECULAR SIEVE TRAP,
Max-Planck-Institut fuer Chemie, Mainz (West Germany).
For primary bibliographic entry see Field 05A.
W73-05244

INFLUENCE OF COLUMN CONFIGURATION ON PERFORMANCE IN HIGH EFFICIENCY LIQUID CHROMATOGRAPHY.
Northeastern Univ., Boston, Mass. Dept. of Chemistry.
H. Barth, E. Dallmeier, and B. L. Karger.
Analytical Chemistry, Vol 44, No 11, p 1726-1732, September 1972. 5 fig, 5 tab, 27 ref.

Descriptors: *Performance, *Chemical analysis, Pollutant identification, Efficiencies, Columns.
Identifiers: *Liquid chromatography, *Column configuration, Coils, Peak broadening, Chromatography columns, Corasil I, Adsorbents.

The influence of coiling on HETP in high performance liquid chromatography has been shown to depend upon column (r sub o) and coil radii (R sub o). Aluminum columns (r sub o equals 0.95 mm), packed with Corasil I (27-35 microns) and coated in situ with 3,3'-oxydipropionitrile (ODPN), showed significant efficiency losses when coiled to a radius smaller than 13 cm; e.g., when coiled to R sub o equals 1 cm, a sixfold increase in HETP was obtained. No efficiency loss occurred when columns of smaller tube radii (r sub o equals 0.38 mm) were coiled down to R sub o equals 1 cm. Larger diameter columns (r sub o equals 2.4 mm), when coiled (R sub o equals 2.4 cm), gave a fourteenfold increase in HETP. Also column geometries in which the direction of coiling was alternated (figure '8' and 'S' configurations) gave no efficiency loss when compared to straight columns. Experiments have shown that peak broadening due to coiling in figure '8' columns depends on the extent of lateral mass transfer. (Byrd-Battelle)
W73-05249

HIGH PERFORMANCE LIQUID CHROMATOGRAPHY ON SMALL PARTICLE SILICA GEL,
Varian Aerography, Walnut Creek, Calif.
R. E. Majors.
Analytical Chemistry, Vol 44, No 11, p 1722-1726, September 1972. 4 fig, 1 tab, 17 ref.

Descriptors: *Efficiencies, Chemical analysis, Pressure, Density, Pollutant identification.
Identifiers: *Liquid chromatography, *Silica gel, *Chromatography columns, Slurry techniques, Linear velocity, Adsorbents, Corasil II.

Liquid chromatographic columns of 5- to 10-microns TLC grade silica gel have been packed by a high pressure, balanced density slurry technique. The columns have yielded HETP values of less than 0.1 mm at a linear velocity (v) of 1.18 cm/sec. For nitrobenzene 15 effective plates per second were generated at 1.18 cm/sec. The HETP vs. v curve was lower than that obtained on Corasil II, a porous layer bead (PLB) adsorbent. The columns showed little loss of efficiency at high v's. The sample loading was greater than for an equal weight of PLB, but not so great as predicted by the ratio of surface areas. (Byrd-Battelle)
W73-05250

THE RENAISSANCE IN POLAROGRAPHIC AND VOLTAMMETRIC ANALYSIS,
Princeton Applied Research Corp., N.J. Chemical Instrument Corp.
J. B. Flato.
Analytical Chemistry, Vol 44, No 11, p 75A-87A, September 1972. 10 fig, 8 ref.

Descriptors: *Instrumentation, *Polarographic analysis, *Methodology, Chemical analysis, Electrochemistry, Laboratory equipment, Zeta potential.
Identifiers: *Voltammetric analysis, Differential pulse polarography, AC polarography, Linear sweep voltammetry, Anodic stripping voltammetry, Differential pulse voltammetry, Potentiostatic control, Sensitivity, Reproducibility.

Chemical and modern techniques of polarographic and voltammetric analyses are presented as an update of the theoretical bases and capabilities of methods such as differential pulse polarography, alternating current polarography, fast linear sweep voltammetry, direct anodic stripping voltammetry, and differential pulse anodic stripping voltammetry. The instrumentation and methodology of the above techniques provide significant improvements in resolution and sensitivity parameters over dc polarography. Sample polarograms and analytical methods are included. (Mackan-Battelle)
W73-05251

MEASUREMENT OF NITRATES AND NITRITES IN THE CULTURE SOLUTION (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Inst. of Biochemistry and Physiology of Microorganisms.
For primary bibliographic entry see Field 05A.
W73-05259

WATER-CHEMICAL INVESTIGATIONS IN THE CSONGRADSZEGED REACHES OF THE TISZA,
For primary bibliographic entry see Field 05A.
W73-05284

RECORDS OF HYDROLOGIC DATA, WALTON COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 07C.
W73-05295

THE EXERGY OF THERMAL WATER,
Oregon State Univ., Corvallis. School of Oceanography.
G. Bodvarsson, and D. E. Eggers.
Geothermics (Italy), Vol 1, No 3, p 93-95, September 1972. 2 fig, 3 tab, 4 ref.

Descriptors: *Geothermal studies, *Thermodynamics, *Thermal water, *Thermal power, *Hydrothermal studies, Energy transfer, Enthalpy, Water temperature.
Identifiers: Exergy (Geothermal engineering).

The exergy of a substance is defined as the theoretical amount of mechanical work which can be derived from its heat content at given initial and end conditions. At given end conditions, the exergy is a state variable. The exergy per unit mass of pure water is tabulated for the most important initial and end temperatures. An example shows the exergy flux in geothermal power plants. (Knapp-USGS)
W73-05296

GEOLOGICAL ASPECTS OF THERMAL WATER OCCURRENCES IN HUNGARY,
Research Inst. for Water Resources Development, Budapest (Hungary).
K. Korim.
Geothermics (Italy), Vol 1, No 3, p 96-102, September 1972. 5 fig, 6 ref.

Descriptors: *Geothermal studies, *Thermal water, Enthalpy, Hydrothermal studies, Hydrogeology, Water temperature, Water resources development, Heat flow.
Identifiers: *Hungary.

In Hungary geothermal resources are in the form of low enthalpy waters within Pliocene - Upper Pannonian reservoirs consisting of sand and sandstone series, and within fractured carbonate rocks mainly of Triassic age. Maximum water temperature is about 100 deg C. Little is known about the nature of the heat source. Geothermal phenomena are controlled primarily by subcrustal magmatic processes and secondarily by other geologic factors such as tectonics, sedimentation and compaction. The resulting geothermal anomaly, accompanied by favorable hydrogeologic conditions, allows an abundance of thermal waters in many parts of the country, particularly in the southeast part of the Great Hungarian Plain. There are more than 450 thermal water wells producing waters warmer than 35 deg C in Hungary. (Knapp-USGS)
W73-05297

DEVELOPMENT AND UTILIZATION OF THERMAL WATERS IN HUNGARY,
Research Inst. for Water Resources Development, Budapest (Hungary).
For primary bibliographic entry see Field 04B.
W73-05298

CHEMICAL COMPOSITION OF A SALINE LAKE ON ENDERBURY ISLAND, PHOENIX ISLAND GROUP, PACIFIC OCEAN,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 02H.
W73-05299

OCCURRENCE AND QUALITY OF GROUND WATER IN CRYSTALLINE ROCKS OF THE LLANO AREA, TEXAS,
West Virginia Geological and Economic Survey, Morgantown.
For primary bibliographic entry see Field 04B.
W73-05303

QUALITY OF NEAR-SURFACE WATERS IN SOUTHERN ILLINOIS,
Southern Illinois Univ., Carbondale. Dept. of Geology.
For primary bibliographic entry see Field 04B.
W73-05304

SEDIMENT-WATER INTERACTIONS,
Illinois Univ., Urbana. Dept. of Agronomy.
For primary bibliographic entry see Field 05B.
W73-05316

LIQUID MOVEMENT THROUGH KAOLINITE UNDER HYDRAULIC, ELECTRIC, AND OSMOTIC GRADIENTS,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 02F.
W73-05327

INDEX OF WATER-QUALITY STATIONS, WATER YEAR 1972.
Geological Survey, Washington, D.C. Water Resources Div.
For primary bibliographic entry see Field 07C.
W73-05336

THE INVESTIGATION OF THE GEOGRAPHICAL AND VERTICAL DISTRIBUTION OF SEVERAL TRACE ELEMENTS IN SEA WATER USING NEUTRON ACTIVATION ANALYSIS,
Yale Univ., New Haven, Conn. Dept. of Geology and Geophysics.
For primary bibliographic entry see Field 05A.
W73-05403

FIELD DETERMINATION OF NANOGRAM QUANTITIES OF MERCURY IN SOILS AND ROCKS,
Geological Survey, Denver, Colo.
M. Hinkle, K. W. Leong, and F. N. Ward.
Geological Survey Professional Paper 550-B, p B135-B137, 1966. 2 tab, 8 ref.

Descriptors: *Mercury, *On-site tests, *Soil investigations, *Analytical techniques, Rocks, Geochemistry, Colorimetry, Catalysts, Spectrophotometer.

A method for determining nanogram quantities of mercury in geological materials is based on the catalytic effect of mercury on the reaction of ferrocyanide with nitrosobenzene to produce a violet-colored compound whose intensity is proportional to the mercury present. The mercury is released by heating a sample of soil or crushed rock to about 650 C. As little as 30 nanograms of mercury (30 parts per billion in a 1-gram sample) can be detected. The reliability of the method is adequate to permit its use in geochemical surveys that utilize mercury as a pathfinder element. (Eagle-Vanderbilt)
W73-05410

INFLUENCE OF AVAILABLE WATER OF SOILS ON THE CIRCULATION OF NITROGENOUS COMPOUNDS AND CAMBIAL FUNCTION IN PINUS PINASTER,
Bordeaux Univ., Talence (France). Department de Physiologie Vegetale.
For primary bibliographic entry see Field 02I.
W73-05436

WATER IN ST. JOHN, U.S. VIRGIN ISLANDS,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 04B.
W73-05496

RECENT APPLICATIONS OF MASS SPECTROMETRY AND COMBINED GAS CHROMATOGRAPHY-MASS SPECTROMETRY TO PESTICIDE RESIDUE ANALYSIS,
Food and Drug Administration, Perrine, Fla. Div. of Pesticides.
For primary bibliographic entry see Field 05A.
W73-05536

PRINCIPAL-COMPONENT ANALYSIS APPLIED TO CHROMATOGRAPHIC DATA,
Purdue Univ., Lafayette, Ind. Dept. of Chemistry.
D. Macnaughtan, Jr., L. B. Rogers, and G. Wernimont.
Analytical Chemistry, Vol. 44, No. 8, p 1421-1427, July 1972. 9 fig, 1 tab, 12 ref.

Descriptors: *Gas chromatography, *Mathematical studies, Equations, Heavy metals, Organic compounds, Chromatography, Analytical techniques, Metals.
Identifiers: *Data interpretation, *Silver nitrate, *Benzene, Silver.

Principal-component analysis of high-precision gas chromatographic data has been shown to produce meaningful characterization of peak-shape changes. Thus, it provides a means for deconvoluting two overlapped peaks and gives quantitative information on sample composition. The principal-component analysis method is outlined together with the deconvolution procedure. (Little-Battelle)
W73-05541

ULTRASONIC NEBULIZATION IN ATOMIC ABSORPTION SPECTROPHOTOMETRY,
Colorado State Univ., Fort Collins. Dept. of Chemistry.
For primary bibliographic entry see Field 05A.
W73-05542

AN EASILY CONSTRUCTED ALKALI FLAME IONIZATION DETECTOR,
Sun Oil Co., Marcus Hook, Pa.
For primary bibliographic entry see Field 05A.
W73-05543

EVALUATION OF PRECISION OF QUANTITATIVE MOLECULAR ABSORPTION SPECTROMETRIC MEASUREMENTS,
Michigan State Univ., East Lansing. Dept. of Chemistry.
For primary bibliographic entry see Field 07B.
W73-05544

MULTIELEMENT ANALYSIS OF NATURAL WATERS BY NEUTRON ACTIVATION, GROUP CHEMICAL SEPARATIONS, AND GAMMA-RAY SPECTROMETRIC TECHNIQUES,
Battelle-Northwest, Richland, Wash. Pacific Northwest Lab.
For primary bibliographic entry see Field 05A.
W73-05545

PRELIMINARY APPRAISAL OF GROUND-WATER CONDITIONS IN THE VICINITY OF MODESTO, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 04B.
W73-05689

WATER-QUALITY DATA FOR THE FLAMING GORGE RESERVOIR AREA, UTAH AND WYOMING, 1969-72,
Geological Survey, Salt Lake City, Utah.
For primary bibliographic entry see Field 07C.
W73-05693

SUBMARINE HOT SPRINGS AS A SOURCE OF ACTIVE RIDGE SEDIMENTS,
Rosenstiel School of Marine and Atmospheric Science, Miami, Fla.
For primary bibliographic entry see Field 02J.
W73-05697

DISTRIBUTION OF SOME TRACE ELEMENTS IN JURASSIC SEDIMENTS OF THE DNIEPER-DONETS BASIN (O RASPREDELENII NEKOTORYKH MALYKH ELEMENTOV V YURSKIKH OTLOZHENIYAKH DNEPROVSKO-DONETSKOY VPADINY),
For primary bibliographic entry see Field 02J.
W73-05700

GROUNDWATER IN THE UPPER CHARA ARTESIAN BASIN (PODZEMNYYE VODY VERKHNE-CHARSKOGO ARTEZIANSKOGO BASSEYNA),
Moskovskii Geologorazvedochnyi Institut (USSR).
For primary bibliographic entry see Field 02F.
W73-05701

VARIABLES AFFECTING A VALUES AS A MEASURE OF SOIL NITROGEN AVAILABILITY,
California Univ., Davis. Dept. of Soils and Plant Nutrition.
For primary bibliographic entry see Field 02G.
W73-05735

AN ASSESSMENT OF THE RELATIVE IMPORTANCE OF SEVERAL CHEMICAL SOURCES TO THE WATERS OF A SMALL UPLAND CATCHMENT,
Liverpool Univ. (England). Dept. of Zoology.
E. White, R. S. Starkey, and M. J. Saunders.
J Appl Ecol. Vol 8, No 3, p 743-749, 1971.
Identifiers: *Catchments, Chemicals, *Minerals, *England.

An assessment is made of the relative importance of sources of chemicals (minerals) within the waters of the Wet Sleddale catchment. This is an area of hard rocks in upland country. Chemicals from the atmosphere form the major source within the system, chemical erosion being of minor importance. Most of the atmospheric input reaches the ground as a dry deposit. The validity of much published data estimating chemicals in rainfall is questioned.--Copyright 1972, Biological Abstracts, Inc.
W73-05742

CARBONIC ANHYDRASE INTERACTION WITH DDT, DDE, AND DIELDRIN,
Washington Univ., Seattle. Dept. of Chemistry.
For primary bibliographic entry see Field 05B.
W73-05797

OCCURRENCE OF SHALLOW SALTY GROUND WATER IN SELECTED AREAS OF WEST VIRGINIA,
Federal Water Pollution Control Administration, Wheeling, W. Va. Ohio Basin Regin.
For primary bibliographic entry see Field 05B.
W73-05800

CHEMICAL COMPOSITION OF DEEP FORMATION WATERS IN SOUTHWESTERN LOUISIANA,
Tulsa Univ., Okla.
P. A. Dickey, A. G. Collins, and I. M. Fajardo.
American Association of Petroleum Geologists Bulletin, Vol. 56, No. 8, p 1530-1533, August, 1972. 2 fig, 1 tab, 12 ref.

Descriptors: *Connate water, *Chemical analysis, Oil industry, Deep wells, *Pressure, Chlorides, Sampling, *Louisiana, Oil reservoirs, Offshore platforms, Gulf of Mexico, Interstices.
Identifiers: Formation water.

Forty-one formation-water samples from gas fields near Lafayette in southwestern Louisiana were analyzed by the Bureau of Mines to determine whether there is any difference in chemical composition between waters in normally pressured and abnormally pressured geologic intervals. The analytic data plus associated geologic data indicate that the concentration of dissolved solids in the waters is related to the degree of compaction of the adjacent shale, and that most of the samples taken from high-pressure zones are less concentrated in dissolved solids than those taken from normally pressured zones. (Campbell-NWWA)
W73-05821

INSTRUMENTAL SURVEILLANCE OF WATER QUALITY, A REVIEW OF THE ROLE OF ANALYTICAL INSTRUMENTATION,
Beckman Instruments, Inc., Fullerton, Calif.
For primary bibliographic entry see Field 05A.
W73-05824

PREDICTING GAS-CHROMATOGRAPHIC RESOLUTION FOR PAIRS OF N-ALKANE HOMOLOGS,
Purdue Univ., Lafayette, Ind. Dept. of Chemistry.
For primary bibliographic entry see Field 05A.
W73-05847

USE OF INDUCTION FURNACE SOURCE FOR SPECTROMETRIC DETERMINATION OF IODINE,
Cornell Univ., Ithaca, N.Y. Dept. of Chemistry.
For primary bibliographic entry see Field 05A.
W73-05848

SEPARATION OF CADMIUM (II) FROM ZINC (II) AND OTHER METAL IONS ON A CADMIUM SELECTIVE EXCHANGER: TITANIUM SELENITE,
Aligarh Muslim Univ. (India). Dept. of Chemistry.
For primary bibliographic entry see Field 05A.
W73-05849

2L. Estuaries

COMMENTS CONCERNING THE COASTAL ZONE OF THE UNITED STATES,
House, Washington, D.C.
For primary bibliographic entry see Field 06E.
W73-05243

PHYSICS OF BRINE CONING BENEATH SKIMMING WELLS,
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 04B.
W73-05305

LONGSHORE DRIFT, SUBMARINE CANYONS, AND SUBMARINE FANS IN DEVELOPMENT OF NIGER DELTA,
Toronto Univ. (Ontario). Dept. of Geology.
K. Burke.
American Association of Petroleum Geologists Bulletin, Vol 56, No 10, p 1975-1983, October 1972. 10 fig, 21 ref.

Descriptors: *Deltas, *Littoral drift, *Sedimentation, *Sediment transport, *Submarine canyons, Continental shelf, Africa, Turbidity currents, Stratigraphy, Sands, Coasts, Sedimentology.

The southwesterly prevailing wind of the Gulf of Guinea strikes symmetrically on the nose of the Niger delta, causing divergent longshore drifts which meet opposing drifts near Lagos and Fernando Poo. Submarine canyons channel about 1 million cu m of sand a year from each pair of opposing drifts to feed submarine fans on either side of the delta foot. In times of low sea level axial distributaries of the Niger feed a third, now inactive, submarine fan in front of the delta. At the time of the last low sea level numerous submarine canyons formed on the front of the Niger delta, and their heads cut back into the Benin Formation continental sands. As the sea rose, these canyon heads formed wide estuaries which have since been filled. All Quaternary canyons except three currently scoured by resedimented longshore drift material have been filled. Recognition of the submarine fan environment leads to a new symmetrical five-layer interpretation of the structure of the Niger delta: (5) top continental sand unit (Benin Formation); (4) transitional sand/shale unit (Agbada Formation); (3) marine shale unit (Akata Formation); (2) transitional shale-sand unit; (1) bottom submarine fan sand unit. (Knapp-USGS)
W73-05324

BRISTOL BAY: MODEL CONTEMPORARY GRADED SHELF,
Alaska Univ., College. Inst. of Marine Science.
G. D. Sharma, A. S. Naidu, and D. W. Hood.
American Association of Petroleum Geologists Bulletin, Vol 56, No 10, p 2000-2012, October 1972. 13 fig, 33 ref. NSF Grant GB8274.

Descriptors: *Sedimentation, *Continental shelf, *Sediment transport, *Sediment sorting, *Waves (Water), Alaska, Currents (Water), Sedimentology, Provenance, Particle size, Scour, Arctic.
Identifiers: *Grading (Shelf sediments), *Bristol Bay (Alas).

A veneer of contemporary sediments covers the continental shelf in the Bristol Bay region of the southeast Bering Sea. The continental shelf is broad, covering an area of 1,500,000 sq km, and has a smooth bottom and a slope of about 2.4%. Nearshore sediments are poorly sorted gravelly sands which grade to well-sorted fine sands in the central bay. The far offshore sediments are poorly sorted muddy sands. The mean size of the sediments decreases with increasing depth and distance from the coast. Heavy mineral content also decreases from the coast to the outer bay. The mineralogy of the sand reflects sedimentary, high-grade metamorphic and igneous sources in the north and east, and a volcanic source in the south. The general paucity of clay minerals and the dominance of feldspars in the less than 2-micron fractions indicate the absence of intense chemical weathering in the source areas. The Bristol Bay shelf can be delineated into two depositional environments, the inner and the outer shelves. Textural differences in the two environments are caused by storm-generated waves. (Knapp-USGS)
W73-05325

SOME TSUNAMI STUDIES FOR THE WEST COAST OF CANADA,
Department of the Environment, Ottawa (Ontario). Marine Sciences Branch.
For primary bibliographic entry see Field 02E.
W73-05329

RESONANCE PERIODS OF MULTI--BRANCHED INLETS WITH TSUNAMI AMPLIFICATION,
Department of the Environment, Ottawa (Ontario). Marine Sciences Branch.
R. F. Henry, and T. S. Murty.
Manuscript Report Series No 28, p 49-79, 1972. 4 fig, 3 tab, 5 ref.

Descriptors: *Mathematical models, *Tsunamis, *Resonance, *Coasts, *Inlets (Waterways), Methodology, Ocean waves, Water level fluctuations, Equations, Frequency analysis, Analytical techniques, Monitoring, Geomorphology, Input-output analysis.
Identifiers: Multibranched coastal inlets.

For an understanding of the response of a coastal inlet to incoming tsunamis, it is essential to know the frequencies of the first few normal modes of free-oscillation. Difficulties which arise when these resonance frequencies are computed for multibranched inlets by iterative search for successive normal modes are examined. Unless the boundary conditions are applied to each mode in an appropriate manner, spurious modes of oscillation may appear during the numerical computation and further, genuine modes may be overlooked. These spurious modes are spurious only with reference to the entire system but they are probably close to certain resonant modes for some branch of the system. Essentially, the initial and final boundary conditions should be applied in branches of the system where there is appreciable motion. Two other methods, one which requires considerably less programming effort and a so-called impulse response method, are discussed. (Woodard-USGS)
W73-05330

SHORELINE RESOURCE DEVELOPMENT: A PRELIMINARY REPORT OF COASTAL MANAGEMENT AND LAND PLANNING FOR THE TAMPA BAY REGION.
Tampa Bay Regional Planning Council, St. Petersburg, Fla.
For primary bibliographic entry see Field 06B.
W73-05388

AN ECOLOGICAL STUDY OF GEORGIA COASTAL FISHES,
Va. Inst. Sci., Res., Richmond, Va. Virginia Inst. for Scientific Research, Richmond.
M. D. Dahlberg.
U S Natl Mar Fish Serv Fish Bull. Vol 70, No 2, p 323-353. 1972. Illus.

Identifiers: Coasts, Distribution, *Ecological studies, Fishes, *Georgia, Species, *Estuary.

The distribution of fish in relation to ecological factors was studied in a Georgia estuary and adjoining beach and coastal plain creek waters to establish fundamental base lines for the ecology of a relatively undisturbed section of the coast. The distributions of 168 fish species were related to 9 recognizable habitats, temperature, and salinity. Length frequencies and spawning seasons were determined for most of the trawled species that contributed significantly to fish production in the estuary. Collecting by a variety of techniques permitted evaluations of types of life cycles, of diversity in the various aquatic habitats, and of distribution patterns within the estuarine complex and adjoining waters. Numbers of species collected in 9 aquatic habitats were as follows: beach-114, lower reach of the estuary-100, high marsh-56, upper and middle reaches-61, oligohaline creek-40, freshwater-39, tidal canal-22, low-salinity tidal pool-22, high-salinity tidal pool-37.--Copyright 1972, Biological Abstracts, Inc.
W73-05406

STUDIES OF BENTHONIC FORAMINIFERA IN THE RESTIGOUCHE ESTUARY: 1. FAUNAL DISTRIBUTION PATTERNS NEAR POLLUTION SOURCES,
Bedford Inst., Dartmouth (Nova Scotia). Atlantic Oceanographic Lab.
For primary bibliographic entry see Field 05B.
W73-05419

EXCHANGE PROCESSES BETWEEN PETPESWICK INLET AND CONTINENTAL SHELF WATERS, A PRELIMINARY REPORT,
Bedford Inst., Dartmouth (Nova Scotia). Atlantic Oceanographic Lab.
For primary bibliographic entry see Field 05B.
W73-05420

ESTUARINE IN SITU WATER QUALITY MONITORING,
Ocean Data Equipment. Ocean Data Equipment Corp., East Providence, R.I.
For primary bibliographic entry see Field 05G.
W73-05424

NUMERICAL MODEL FOR ESTUARINE WATER QUALITY PREDICTION,
Massachusetts Inst. of Tech., Cambridge.
For primary bibliographic entry see Field 05G.
W73-05425

ENVIRONMENTAL CONSIDERATIONS FOR ESTUARINE DREDGING OPERATIONS,
Oregon State Univ., Corvallis. Graduate Faculty of Ecology.
For primary bibliographic entry see Field 05G.
W73-05443

AN EXPERIMENTAL APPROACH TO THE USE OF DREDGING SPOIL FOR THE CONSTRUCTION OF SALT MARSH ISLANDS,
Marine Science Inst., Bayou La Batre, Ala.
For primary bibliographic entry see Field 05G.
W73-05445

WATER POLLUTION CONTROL IN COASTAL AREAS. THE NATURE OF THE PROBLEM,
For primary bibliographic entry see Field 05G.
W73-05447

THE USE OF BOOMS AS BARRIERS TO OIL POLLUTION IN TIDAL ESTUARIES AND SHELTERED WATERS,
Hydraulics Research Station, Wallingford (England).
For primary bibliographic entry see Field 05G.
W73-05461

A CONDUCTIVITY-TEMPERATURE-DEPTH (CTD) RECORDER AND TWELVE SEMI-CONTINUOUS PROFILES OF TEMPERATURE AND SALINITY,
Johns Hopkins Univ., Baltimore, Md. Chesapeake Bay Inst.
R. C. Seitz.
Chesapeake Bay Institute Special Report 29 (Reference 73-1), January 1973. 25 p, 16 fig, 3 tab, 2 ref. NR-083-016. Navy Contract N0014-67-A-0163-0006.

Descriptors: *Water temperature, *Salinity, *Estuaries, *Potomac River, *Instrumentation, Analytical techniques, Data collections, Profiles, Measurement, Depth.
Identifiers: Vertical measurements.

A recording unit was designed for use with the standard Chesapeake Bay Institute Conductivity-Temperature (ICTI) sensors so that vertical profiles of temperature and conductivity (salinity) can be made from a vessel in estuaries. Rustrak chart recorders are used in conjunction with solid state electronics to provide separate temperature, conductivity and depth recordings in which the sample points are spaced every 10 to 20 cm in the vertical. During July, 1971, 12 vertical profiles of temperature and salinity were collected at 8 stations in the Potomac River estuary from the mouth upstream to Point 52. Large gradients of salinity (10 parts per thousand per meter or more) were observed at station P-16. Since the measurements were made during the summer when the water in the river was being warmed at the surface, the temperature distributions showed a general decrease from the surface to the bottom which may or may not exhibit small temperature inversions at various points along the profile. The salinity and temperature profiles are illustrated for each station. (Woodard-USGS)
W73-05469

WATER FROM THE PRINCIPAL ARTESIAN AQUIFER IN COASTAL GEORGIA,
Geological Survey, Atlanta, Ga.
For primary bibliographic entry see Field 07C.
W73-05472

TEXTURAL INDICATORS OF SEDIMENT DISPERSION IN THE NORTHERN CHANNEL ISLAND PASSAGES, CALIFORNIA CONTINENTAL BORDERLAND,
University of Southern California, Los Angeles. Dept. of Geology.
J. S. Booth.
Available from NTIS, Springfield, Va 22151 as AD-747 703; Price $3.00 printed copy; $0.95 cents microfiche. Final Contract Report, No USC GEOL-71-3, September 1972. 56 p, 24 fig, 2 tab, 17 ref. ONR Contract N00014-67-A-0269-0009.

Descriptors: *Sedimentology, *Sediment transport, *Sediment distribution, *Pacific Ocean, *California, Islands, Channels, Bottom sediments, Bottom sampling, Particle size, Tidal effects, Ocean currents, Winds, Sediments, Physical properties, Geomorphology, Evaluation.
Identifiers: *Northern Channel Islands (Calif), Passages.

The passages between the Northern Channel Islands, California, are the sites of swift bottom currents which make these areas ideal for the study of sediment dispersion in a natural environment. San Miguel Passage and Santa Cruz Channel both show a relationship to the California Current by their southeastward and eastward dispersal patterns, respectively; and in these locales, the current is believed to be the chief agent of dispersion. Santa Cruz Channel is more complex. A lobe of coarse sediment, part of which appears to be relict, in the northern section of the channel shows dispersion to the east. However, finer sediment is moving into the southern part of the area from the east, where it is intercepted by the head of Santa Cruz Canyon. Anacapa Passage shows dominant westward dispersion along both the southern and northern margins. All of the passages are considered at or near a state of dynamic equilibrium with respect to mechanical energy because of the thin veneer of sediment and the high degree of sorting exhibited by the sediment. (Woodard-USGS)
W73-05474

MATHEMATICAL MODEL OF TIDAL REGIMES IN THE BAY OF FUNDY,
Lasalle Hydraulic Lab. Ltd. (Quebec).
F. E. Parkinson.
In: Tidal Power, Proceedings of International Conference, May 24-29, 1970, Nova Scotia Technical College, Halifax: New York, NY, Plenum Press, p 131-152, 1972. 13 fig.

Descriptors: *Tides, *Water level fluctuations, *Seiches, *Tidal powerplants, *Simulation analysis, Mathematical models, Tidal streams, Bays, Canada, Maine, Bores, Tidal bores, Estuaries.
Identifiers: *Bay of Fundy (Canada).

A mathematical model describes the amplification of tidal ranges that occurs going from the mouth to the head of the Bay of Fundy. The amplification is caused by the gradual shelving and narrowing of the bay and near-resonant conditions for the semidiurnal tidal fluctuation. Blocking off part of the bay for a tidal powerplant may lower tide ranges somewhat, partly because of a further shift, due to shortening, away from full resonance, and partly (when the tidal plant is running) because of the artificial ebb and flow imposed on the natural currents. The two basic equations (those of continuity and of motion, including the Coriolis acceleration) were written in finite difference form, and the resulting system of algebraic equations was solved on a step-by-step basis. The assumption of a uniform velocity distribution at any vertical section is basic to the mathematical representation used. (Knapp-USGS)
W73-05475

SEDIMENTATION PATTERNS IN THE BAY OF FUNDY AND MINAS BASIN,
Bedford Inst. Dartmouth (Nova Scotia). Atlantic Oceanographic Lab.
B. R. Pelletier, and R. M. McMullen.
In: Tidal Power, Proceedings of International Conference, May 24-29, 1970, Nova Scotia Technical College, Halifax: New York, NY, Plenum Press, p 153-187, 1972. 23 fig, 23 ref.

Descriptors: *Tides, *Bottom sediments, *Bays, *Sediment transport, Estuaries, Sedimentation, Erosion, Tidal waters, Tidal streams, Canada, Maine, Distribution patterns.
Identifiers: *Bay of Fundy (Canada).

Most of the sediment cover on the floor of the Bay of Fundy was emplaced under subaerial conditions during the glacial episodes of the Pleistocene. Now these relict materials exposed on the Bay floor are evolving into sediments adjusted to the modern hydraulic regime. The resulting deposits bear the distinctive impress of a high-energy tidal regime. Tides in the Bay of Fundy are 6.4 meters at the mouth and 17 meters at the head and are a consequence of the axial dimension of the Bay, which is almost equal to the critical length required for resonance. The tidal wave in the Bay is a standing wave rather than a progressive one and consequently high water is attained nearly simultaneously throughout the Bay. The tidal currents are parallel to the axis of the Bay and at half-flood and mid-depth they average 103 cm/sec on the south shore, and 77 cm/sec on the north shore. Towards the head of the Bay, shoaling and narrowing retard

the tidal wave, and current velocities increase to 206 cm/sec in Minas Channel and up to 556 cm/sec in Minas Passage. (Knapp-USGS)
W73-05476

A MATHEMATICAL MODEL OF THE EFFECT OF A TIDAL BARRIER ON SILTATION IN AN ESTUARY,
Hydraulics Research Station, Wallingford (England).
M. W. Owen, and N. V. M. Odd.
In: Tidal Power, Proceedings of International Conference, May 24-29, 1970, Nova Scotia Technical College, Halifax: New York, NY, Plenum Press, p 457-485, 1972. 14 fig, 1 tab, 12 ref.

Descriptors: *Mathematical models, *Estuaries, *Sedimentation, Sediment transport, Silting, Sediment control, Tides, Tidal streams, Water level fluctuations, Erosion.
Identifiers: *Thames River (England).

A mathematical model of silt movement in the Thames Estuary, England, was used to reproduce the periodic pattern of suspended silt concentrations and the location of the main areas of deposition of silt in the estuary to test the effects of silt movement in the estuary of various tidal barriers proposed for flood protection. The model successfully reproduced the known regime of siltation during spring and neap tides for a constant river flow of about twice the long-term average at Teddington. The effects of a movable barrier at either Woolwich or Blackwall on silt movement in the estuary were investigated. From the results it appeared that the better site for a half-tide barrier would be at Blackwall rather than Woolwich since it would only slightly affect the Mud Reaches, and any dredging required to maintain existing depths would be much less than in the new mud reaches caused by a similar barrier at Woolwich. (Knapp-USGS)
W73-05477

POTOMAC RIVER SEDIMENT STUDY,
Naval Ordnance Station, Indian Head, Md.
For primary bibliographic entry see Field 05B.
W73-05483

SEA-WATER INTRUSION IN THE UPPER PART OF THE FLORIDAN AQUIFER IN COASTAL PASCO COUNTY, FLORIDA, 1969,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 07C.
W73-05485

SALINE-WATER INTRUSION FROM DEEP ARTESIAN SOURCES IN THE MCGREGOR ISLES AREA OF LEE COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 02F.
W73-05487

FATE OF DDT IN SEVERN ESTUARY SEDIMENTS,
Bristol Univ. (England). School of Chemistry.
For primary bibliographic entry see Field 05B.
W73-05569

STATUS OF COASTAL ZONE LEGISLATION,
South Carolina Univ., Columbia.
For primary bibliographic entry see Field 06E.
W73-05606

PRIMARY PRODUCTIVITY IN RARITAN BAY AND ITS RELATIONSHIP TO POLLUTION,
Rutgers - The State Univ., New Brunswick, N.J.
For primary bibliographic entry see Field 05C.
W73-05670

COOPERATIVE GULF OF MEXICO ESTUARINE INVENTORY AND STUDY, LOUISIANA: PHASE III, SEDIMENTOLOGY,
Louisiana Wildlife and Fisheries Commission, New Orleans.
B. B. Barrett, J. W. Tarver, W. R. Latapie, J. F. Pollard, and W. R. Mock.
Available from NTIS, Springfield, Va 22151 as COM-72-11307 Price $3.00 printed copy; $0.95 microfiche. Report 1971. 60 p, 20 fig, 18 tab, 2 ref.

Descriptors: *Sedimentology, *Bottom sediments, *Estuaries, *Gulf of Mexico, *Louisiana, Sediments, Sampling, Data collections, Bays, Coasts, Bed load, Inlets (Waterways), Physical properties, Particle size, Sands, Silts, Clays, Correlation analysis, Evaluation, Sediment distribution.

There were 1,536 bottom sediment samples taken from the waters of coastal Louisiana between March 1968 and June 1970. The upper three inches of the sample was used to determine grain size distribution. The kurtosis, skewness, standard deviation, median, and mean were calculated for all samples. Sediments across coastal Louisiana were similar. Major differences occurred at the interface of the Gulf of Mexico and the estuaries where energy levels were high, as well as near the mouths of major streams. Generally, the sediment particles graded from coarse near the Gulf of Mexico and the barrier islands to fine in the upper estuaries. Size fractions in order of decreasing abundance were silt, clay, sand, and granules. Of the silt fraction, coarse silt, 4 to 5 phi, was the most abundant. The percentage of clays smaller in size than 10 phi were much higher than clay percentages larger than 10 phi. The most abundant sand fraction was 3 to 4 phi, which is very fine sand. This sand size was predominantly quartz. Granules were predominantly shell fragments. Sediments in the large water areas with wide openings to the Gulf of Mexico were generally coarse-grained and relatively well sorted, had positive skewness values, and were leptokurtic. Sediments in the small, semienclosed water areas surrounded by marsh were usually fine-grained and poorly sorted, had negative skewness values, and were platykurtic. (Woodward-USGS)
W73-05673

TIDAL-FLAT SEDIMENTATION AT COOLEY LANDING, SOUTHWEST SAN FRANCISCO BAY,
California Univ., San Francisco. Dept. of Geology.
R. Pestrong.
Sedimentary Geology, Vol 8, No 4, p 251-288, December 1972. 20 fig, 2 tab, 33 ref. NR Contract Nonr-4430 (00).

Descriptors: *Sedimentation, *Sediment transport, *Sediment sorting, *Tidal waters, Tidal marshes, *California, Shallow water, Sedimentology, Currents (Water), Tidal streams.
Identifiers: *San Francisco Bay.

Tidal-marsh and mud-flat sedimentation on portions of the southwestern side of San Francisco Bay is described. Sediments transported and deposited within this low-energy environment range primarily between 9 and 10.50 phi in diameter and are distributed in accordance with a principle of scour and settling lag proposed for sediments in the North Sea. The finer sediments are concentrated nearer the higher portions of the tidal flats and marshes where lower ebb-flow velocities are unable to transport them farther bayward. More bedload sediment is moved on the flood than on the ebb portions of the tidal cycle both on the tidal-flat and through the marsh-channel system. Flow conditions peculiar to the marsh-mud flat interface result in the bulk of sedimentation occurring on the uppermost tidal flats, at the base of the marsh. The growth of the tidal channels accompanies the extension of the marsh onto the tidal flat. This development is documented on aerial photographs taken over a 6-year period. An equilibrium condition will be reached when deposition of sediments at the front of the marsh is matched by erosion of these deposits by the swifter tidal currents that are present as the marsh front approaches the main bay channel. Higher shear strengths and densities are found in the slightly elevated tidal-channel levees than are present for the adjacent mud flats because of the longer periods of desiccation the levees experience. X-radiologic studies of near-surface tidal-flat mud slabs show sedimentary structures not apparent in photographs, and suggest penecontemporaneous deformation of the muds. (Knapp-USGS)
W73-05685

THE DEVELOPMENT OF MARINA DEL REY,
University of Southern California, Los Angeles. Coastal Zone Planning and Management Project.
For primary bibliographic entry see Field 06B.
W73-05690

BOTTOM SEDIMENT DISTRIBUTION IN CERTAIN INSHORE WATERS OF HONG KONG,
Hong Kong Univ. Dept. of Physics.
W. D. Chesterman, and H. K. Wong.
International Hydrographic Review, Vol 48, No 2, p 51-69, July 1971. 14 fig, 28 ref.

Descriptors: *Sediment distribution, *Bottom sediments, *Estuaries, *Sedimentology, *Coasts, Foreign countries, Sampling, Sonar, Analytical techniques, Data collections, Sediments, Physical properties, Particle size, Continental shelf.
Identifiers: *Hong Kong, Coastal waters.

The continental shelf in the vicinity of Hong Kong is about 100 miles wide, trending northeast-southwest parallel to the Chinese coast. The bottom slope averages 0 deg 02 min seawards, increasing to 1 deg 50 min near the shelf break. In 1964, a study was made of the bottom sediment distribution in these inshore areas, using a side-scane sonar. The results are presented in four bottom sediment distribution charts. Much of the southeastern approaches to Hong Kong is covered by a very soft, grey organic clay, containing fragments of shell and other debris derived from marine life. Lantao Channel lies in the Pearl River estuary. Its bottom sediments consist mostly of riverborne material in the form of fine-grained sand, silt, and marine clay. Port Shelter and Rocky Harbour lie along the eastern coast of the mainland portion of Hong Kong. They include a large number of rocky, rugged islands. Tuffs and coarse agglomerates with boulders reaching 6 feet in dimension are very common. Tolo Channel has an average depth of 50 feet sloping from 25 feet in the southwest to 70 feet in the northeast. The sea floor itself is thickly clay-laden. (Woodard-USGS)
W73-05698

RECENT MARINE SEDIMENTS OF CARMEL BAY, CALIFORNIA,
Naval Postgraduate School, Monterey, Calif.
L. S. Carter.
Available from NTIS, Springfield, Va., 22151 as AD-741 122, Price $3.00 printed copy; $0.95 microfiche. M Sc Thesis, December, 1971. 57 p, 9 fig, 2 tab, 21 ref.

Descriptors: *Sedimentology, *Particle size, *Sediment transport, *Bays, *California, Sediments, Bottom sediments, Sedimentation, Sands, Silts, Gravels, Physical properties, Erosion, Sampling, Data collections.
Identifiers: *Carmel Bay (Calif).

Fifty-six sediment samples were collected within Carmel Bay, California, for textural analysis. The sediments within the Carmel Submarine Canyon consist, for the most part, of poorly to very poorly sorted very fine sand and coarse silt. The shelf area surrounding the canyon is primarily comprised of moderately to very poorly sorted sand,

with a small area of very poorly sorted gravel in the northeastern section of the bay. Consideration of textural parameters such as mean size, standard deviation, and skewness suggests that the sediments are under the influence of dynamic sediment transport. The bay appears to be a sedimentary system primarily isolated from adjacent coastal sediment sources, with the major sources of sedimentary deposits being terrigenous debris from the Carmel River, erosion and weathering of the local coastline and offshore rocks by wave and weather, and the shells and tests of numerous calcareous marine organisms. Movement of sediments by slumping and gravity sliding down the Carmel Submarine Canyon appears to be the only form of sediment removal within the bay. (Woodard-USGS)
W73-05796

A SELECT BIBLIOGRAPHY ON POLLUTION OF ESTUARIES AND COASTAL WATERS WITH PARTICULAR REGARD TO INDUSTRIAL EFFLUENTS,
British Iron and Steel Research Association, London (England). Strip Mills Div.
For primary bibliographic entry see Field 05B.
W73-05805

RETENTION OF LARVAL HERRING WITHIN THE SHEEPSCOT ESTUARY OF MAINE,
National Marine Fisheries Service, West Boothbay Harbor, Maine. Boothbay Harbor Lab.
J. J. Graham.
Identifiers: Estuary, *Herring (Larval), *Maine, Sheepscot estuary (Me).

A system of larval movements is demonstrated that retains larval herring within an estuary despite its seaware residual flow. Data are reviewed from a 23 factorial design using buoyed and anchored nets in a narrow channel of the estuary. Three factors were involved: location, tidal phase, and depth. Catch rates of larvae relative to these factors suggested that the larvae maintained their position in the upper portion of the estuary by occupying the landward net tidal flow near the bottom, moving upward upon reaching the limit of their landward penetration then seaward in the net flow near the surface, and finally descending again into the landward net flow.--Copyright 1972, Biological Abstracts, Inc.
W73-05818

THE EFFECTS OF DIURNAL THERMOPERIOD TREATMENTS ON REPRODUCTIVE FUNCTION IN THE ESTUARINE GOBIID FISH, GILLICHTHYS MIRABILIS COOPER,
California Univ., Berkeley. Dept. of Zoology.
For primary bibliographic entry see Field 05C.
W73-05843

03. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

SALINE WATER CONVERSION PROGRAM.

Hearing--Subcomm. on Irrigation and Reclamation--Comm. on Interior and Insular Affairs, House of Representatives, 92d Cong, 1st Sess, April 27, 1971. 125 p, 1 map, 1 tab.

Descriptors: *Water supply, *Water treatment, *Desalination, *Water purification, *Desalination processes, Water, Water pollution, Distillation, Legislation, Reverse osmosis, Waste water treatment, Membranes, Pressure, Dialysis, Research and development, Federal government, Desalination plants, Water supply development.

The Committee took testimony on two bills dealing with saline water conversion. The first bill (H.R. 5333) was an appropriations authorization for the existing program. The second bill included policy and detailed provisions for continuing a program of research and development and demonstration of processes for the conversion of saline and other chemically contaminated water for beneficial uses. The desalting program has four major elements. The first of these is basic research. Second is the development program converting research development into engineering achievements. Next is the test bed and prototype program that checks the engineering and economic feasibility of these processes. The fourth element is studies that provide information on desalting costs and how desalting can help meet water supply needs. Some of the programs currently being researched and developed include the new pressure dialysis process, membrane processes, distillation and reverse osmosis. Several persons from the Department of Interior and persons connected with water resources testified at the hearing. This testimony was generally favorable and explanatory in nature. (Nielsen-Florida)
W73-05221

FEDERAL RESEARCH IN POTABLE-WATER TECHNOLOGY--JOINT DISCUSSION,
For primary bibliographic entry see Field 05G.
W73-05232

DESALTING AS A SOURCE OF WATER SUPPLY,
Office of Saline Water, Washington, D.C.
E. F. Miller.
Journal of the American Water Works Association, Vol 64, p 804-807, December 1972. 2 fig, 3 photo, 2 tab.

Descriptors: *Desalination, *Desalination plants, *Potable water, *Legislation, *Desalination processes, Desalination wastes, Water quality, Water supply, Electrodes, Facilities, Reverse osmosis, Waste disposal, Cost analysis, Cost comparison, Water supply development.

Investigations reveal that, as compared to the cost of current water supplies to certain metropolitan areas, seawater desalting is expensive. However, rapid advances are being made in the technology of desalting by reverse osmosis. Research suggests that today many small communities' desalting technology may be applied to produce potable water at less cost than fresh water importation. Improvement of the quality of present supplies may be the more immediate role for desalting applications in the United States heartland. The cost of wastewater disposal may vary, depending on each state's environmental control procedure. Desalting can make a significant contribution by removing those dissolved constituents whose presence has been responsible for the use of synthetic detergents from municipal water supplies. (Reed-Florida)
W73-05602

REVERSE OSMOSIS-A TOOL FOR MODERN INDUSTRY,
Permutit Co., Paramus, N.J.
For primary bibliographic entry see Field 05F.
W73-05640

PROBLEMS AND SOLUTIONS IN LARGE SCALE EVAPORATION,
Catalytic, Inc., Philadelphia, Pa.
C. E. Ennis.
Water and Sewage Works, Vol 119, No 8, p R-102/R-107, August 1972. 3 fig.

Descriptors: *Evaporation, *Evaporation control, *Heat transfer, *Heat control, *Scaling, *Desalination, Construction materials, Cost analysis, Water treatment, Water quality control, Brines.

Various problems and solutions to these problems associated with large scale evaporation processes are summarized. Problems considered are heat loss, scale buildup and construction materials. While scale buildup can be controlled and new construction materials on the market prevent corrosion, the problem of heat loss has not been completely solved. (Smith-Texas)
W73-05647

3B. Water Yield Improvement

EXTENDING UTILITY OF NON-URBAN WATER SUPPLIES,
Utah State Univ., Logan.
J. M. Bagley.
Prepared for the National Water Commission, July 1971. 241 p, 12 fig, 3 tab, 80 ref, append. NWC 71-003.

Descriptors: *Water supply, *Technology, Management, Planning, Water resources development, Economic efficiency, Conservation.
Identifiers: *Non-urban water uses, Water conservation.

Approaches to conserving and efficiently using existing water supplies in non-urban areas are studied. The study is framed as a three-part question: (1) what are the physical and managerial possibilities and opportunities for extending the usefulness or utility of a given water supply. (2) what are the institutional, legal, political, or economic constraints which inhibit or restrict the attainment of these technological or managerial potentials. and (3) if such constraints are significant, how can they be overcome to achieve technologically or managerially possible measures for increasing the 'usability' of a given water supply. Extending the utility of an existing water supply in any river basin can be accomplished by following three general guiding principles: (1) minimize depletions whereever possible, (2) generally preserve, protect, and improve water quality, and (3) make carefully considered allocations of existing supplies. Specific recommendations for improving the utility of a water supply are grouped according to general recommendations, facilitating rural and development planning, improving aesthetic and recreational uses and opportunities, improving water rights and their administration, and improving economic and social management of water. (Settle-Wisconsin)
W73-05755

ECONOMICS OF CHAPARRAL MANAGEMENT IN THE SOUTHWEST,
Forest Service (USDA), Tucson, Ariz. Rocky Mountain Forest and Range Experiment Station.
P. F. O'Connell.
In: National Symposium on Watersheds in Transition, Co-sponsored by American Water Resources Association and Colorado State University, June 1972, Fort Collins, Colorado. p 260-266. 5 fig, 5 tab, 18 ref.

Descriptors: Economics, *Cost-benefit analysis, *Watershed management, *Brush control, *Water yield improvement, *Land clearing, Project planning, Evaluation, *Chaparral, *Arizona, Arid lands, Wildlife management, Forest management, Range management, Multiple-purpose projects, Social aspects, Decision making, Water conservation.

For several years, downstream water users in Arizona have been urging the public land management agencies to increase water flow in the major basins. A dense chaparral watershed (East Sycamore) on the Tonto National Forest, Arizona, was therefore selected to explore the economics of chaparral management. Costs and benefits were developed for three alternative plans that represented varying amounts of vegetation manipulation. The evaluation period was 50 years.

Outputs and effects considered for each alternative include water, sediment, forage, outdoor recreation, wildlife habitat, landscape esthetics, and fire hazard. Primary emphasis was on the development of values for the products affected. Major conclusions indicate: (1) a meaningful quantitative analysis can be made of a proposed chaparral management program, (2) East Sycamore should be treated if the decision maker's primary goal is to use it as an experimental watershed to gain more information on the effects of chaparral conversion, (3) East Sycamore should not be treated if it is considered as one of several management alternatives available to the decision maker. Water yield increases have greater potential in other chaparral areas with deeper, better developed granitic soils. Potential increase in usable forage production would be greater in watersheds with more moderate slopes and soils with better moisture retention. (Black-Arizona)
W73-05779

CLOUD SEEDING INTERPRETED THROUGH ATMOSPHERIC WATER BALANCE,
Colorado State Univ., Fort Collins. Dept. of Atmospheric Science.
J. L. Rasmussen.
Journal of the Irrigation and Drainage Division, American Society of Civil Engineers, Vol 98, No IR4, Paper 9413, p 585-592, December, 1972. 7 fig, 1 tab, 8 ref.

Descriptors: *Evaporation, *Snowpacks, *Colorado River basin, *Cloud seeding, *Water balance, Weather modification, Climatology, Meteorology, Streamflow forecasting, Runoff forecasting, Colorado.

The potential for increasing precipitation over the central Colorado Rockies is good within fairly well defined limites of cloud top temperature, wind, and humidity. The atmospheric water balance of the Upper Colorado River Basin was studied using data from 20 radiosonde stations surrounding the area. Precipitation and nonprecipitation days occur in periods lasting several days. The precipitation periods are broken into storm periods with large daily precipitation values and into rather unsettled periods with continuous days of light precipitation but not much accumulation. Seasonal accumulation is dependent upon storm periods. Evaporation periods had successive days of negative P-E values. The potential for evaporation is high; increase of snowpack through cloud seeding over elevations should not materially affect the water resource. Increase over higher elevations during spring must also be evaluated in the light of this result. (Knapp-USGS)
W73-05793

SIMULATION OF SALT CEDAR EVAPOTRANSPIRATION,
Colorado Univ., Denver.
For primary bibliographic entry see Field 02D.
W73-05795

3C. Use of Water of Impaired Quality

NEED FOR CONTROLLING SALINITY OF THE COLORADO RIVER.
Colorado River Board of California, Los Angeles.
For primary bibliographic entry see Field 05G.
W73-05352

THE MINERAL QUALITY PROBLEM IN THE COLORADO RIVER BASIN.
Environmental Protection Agency, San Francisco, Calif. Region IX; and Environmental Protection Agency, Denver, Colo. Region VIII.
For primary bibliographic entry see Field 05C.
W73-05353

PROGRAM DESIGN-1971, SAN FRANCISCO BAY REGION ENVIRONMENT AND RESOURCES PLANNING STUDY.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 06B.
W73-05691

EFFECTS OF SALTS ON SEED GERMINATION OF SOME DESERT GRASSES,
Central Arid Zone Research Inst., Jodhpur (India).
S. K. Sharma, and R. K. Gupta.
Annals of Arid Zone, Vol 10, No 1, p 33-35, March, 1971. 3 tab, 7 ref.

Descriptors: *Germination, *Salt tolerance, *Grasses, *Halophytes, Bioassay, Arid lands, Laboratory tests, Seeds, Seed treatment, Saline soils, Osmotic pressure, Plant physiology, Viability, Salts, Planting management, Range management, Artificial substrates, Bioindicators, Land reclamation.
Identifiers: *Rajasthan, India.

Though various effects of salts on crop plant production have been studied, grasses have received little attention. To evaluate the salt tolerance of some fodder grasses of Rajasthan at the time of their germination, eight different species were tested at five different salt concentrations in petri-dishes. The eight species were: (1) Dactyloctenium aegyptium, (2) Dactyloctenium sindicum, (3) Digitaria adscendens, (4) Lasiurus sindicus, (5) Dichanthium annulatum, (6) Chloris virgata, (7) Echinochloa colonum, (8) Cenchrus setigerus. Dactyloctenium aegyptum, Dichanthium annulatum and Chloris virgata showed germination of 50, 14, and 22 percent respectively in a solution of 13.6 g/lit salt concentration. Permutation and combination of the three types of salts in more than one way would throw more light on the effect of individual salts and in combination. From this study it was definitely determined that the above three species are relatively better salt tolerant grasses than the others tested. Dactyloctenium sindicum and Cenchrus setigerus are highly sensitive to saline media. Masimum percentage germination was recorded under the first treatment (1.7 g/lit) in Dactyloctenium aegyptium. (Black-Arizona)
W73-05769

WATER, SALT PATTERNS WITH DESERT DRIP IRRIGATION,
California Univ., Riverside. Citrus Research Center and Agricultural Experiment Station.
D. Halsey.
Citrograph, Vol 57, No 4, p 147-148, February, 1972. 1 fig.

Descriptors: *Soil water movement, *Irrigation practices, *Saline water systems, *Soil water, *Salinity, Salts, *Lemons, Specific conductivity, Loam, Sands, Soil structure, Soil cement, Root development, Soil profiles, Evaporation, Mulching, California, Arid lands.
Identifiers: *Drip irrigation, Saturation extract, Coachella soil.

The movement of water and salt in an undisturbed desert soil is reported with reference to dripper irrigation of lemons near Mecca, California. New lemon trees were irrigated individually by one two-gallon/hour drippers using water with electrical conductivity of 1.9 millimhos. The coachella soil has an 18 inch loamy fine sand surface overlaying a fine sand without structure or cementation. After two months of irrigation and normal and healthy root growth, trenches were dug to observe the wetted profile under the last dripper on a line. Soil samples were taken at one-foot intervals vertically and horizontally, and conductivity of the saturation extract was measured. Lateral water movement extended 11.5 feet from the dripper. Vertical penetration was deepest directly under the dripper at 4.5 feet. Salt was concentrated at extreme lateral points, largely as a result of surface evaporation. A mulch is suggested to reduce the salt concentration in lateral extremities. (Popkin - Arizona)
W73-05781

EFFECT OF LEVELS OF PHOSPHORUS AND SODIUM SALTS ON GERMINATION OF WHEAT S 227,
Udaipur Univ. (India).
K. K. Vyas, and P. Singh.
Annals of Arid Zone, Vol 10, No 2 and 3, p 180-185, June-September, 1971. 3 tab, 11 ref.

Descriptors: *Saline soils, *Germination, *Crop production, *Crop response, *Salt tolerance, Salinity, Wheat, Agronomy, Arid lands, Soil environment, Bioassay, Plant physiology.
Identifiers: Salt injury.

Of new high yield varieties of wheat developed in recent years, S227 has been recommended for Rajasthan. Since it is important to know its degree of salt tolerance at germination when proposing a crop variety for saline and alkali conditions, a field experiment was conducted during the year 1969-70 to study the effect of graded levels of phosphorus and sodium salts on germination of this variety. Treatments consisted of three levels of phosphorus, three sodium salts (sodium bicarbonate, sodium chloride, and sodium sulphate) and four levels of salt concentration (0.00, 0.05, 0.10, and 0.15 percent on soil weight basis). The effect of sodium salts on germination of wheat S227 was significant. sodium bicarbonate was the most detrimental, followed by sodium chloride and sodium sulphate in that order. Germination decreased significantly with increase in concentration of salt from 0.05 to 0.15 percent as compared with no salts application treatment. Effect of increasing levels of phosphorus on germination was not significant. (Black-Arizona)
W73-05784

3D. Conservation in Domestic and Municipal Use

SOCIAL ASPECTS OF URBAN WATER CONSERVATION,
Century Research Corp., Arlington, Va.
H. E. Abbott, K. G. Cook, and R. B. Sleight.
Available from the National Technical Information Service as PB-214 970, $3.00 in paper copy, $0.95 in microfiche. Final Report, August 1972. 152 p, 109 ref, 4 append. OWRR C-2134 (3401) (1). 14-31-0001-3401.

Descriptors: *Water shortage, *Social aspects, *Water conservation, *Psychological aspects, *Water consumption, *Planning, Water utilization, Attitudes, Droughts, Floods, Management, Water quality, Legislation, Domestic water, Cities, Education, Communication, Hurricanes, Florida, Georgia, New York.
Identifiers: *Emergency planning, Voluntary restriction, Compulsory restriction, Northeast drought, Tropical storm Agnes, Hurricane Camille, Line break.

Water users in communities which had suffered shortages were surveyed directly, conferences were held with city officials, and literature was reviewed. The study goal was to find socially acceptable and democratic methods to follow to achieve reductions in water use. Voluntary and compulsory restrictions worked equally well, but since consumers generally prefer voluntary controls, it is recommended that they be used first. Although people respond well to instructions relayed through private communications media, community officials shoud release official conservation requests and messages and coordinate communications. Advance preparation for releases will enhance their effectiveness. Managers should undertake a continuous public educational pro-

gram to promote a better knowledge and appreciation of domestic water matters including conservation methods. Actions by managers which followed established contingency plans were most effective. All managers are advised to develop, formalize, and utilize such plans.
W73-05211

PLANNING, TESTING, AND DESIGN FOR WATER RECLAMATION FOR LOS ANGELES,
Los Angeles Dept. of Water and Power, Calif.
For primary bibliographic entry see Field 05D.
W73-05583

THE ROLE OF WATER AND SEWER EXTENSION FINANCING IN GUIDING URBAN RESIDENTIAL GROWTH,
Tennessee Univ., Knoxville.
D. A. Downing.
Tennessee University Water Resources Research Center, Knoxville, Report No 19, June 1972. 184 p, 7 fig, 5 tab. OWRR B-014-TENN (2).

Descriptors: *Water supply, *Sewers, *Water utilization, *Municipal water, Land use, Utilities, Planning, Investment, Costs, Water pollution control.
Identifiers: *Extensions, *Urban growth, *Residential growth, Development, Recommendations.

Approaches to adjusting water and sewer financing arrangements to complement a policy of urban growth guidance are studied. The analysis relies on two basic sources: (1) literature drawn from fields such as planning, public finance, and urban land economics; and (2) case studies of four urban areas. The study suggests several features that would characterize a model financing scheme. First, a lower user charge should be levied in areas which are fully developed or that have priority for immediate development. Higher user charges in sparsely populated areas would be designed to discourage settlement in these areas. Second, a fixed rate benefit assessment should be applied per acre and per front foot to property which connects and to property which has access to water or sewer lines. Third, connection fees should be increased for larger lot sizes in order to encourage more compact development. Fourth, the public system should construct and finance major water and sewer lines to meet anticipated development demands. Fifth, the developer should construct and finance extensions from major lines, as well as construct major lines when they are desired prior to planned public construction. (Settle-Wisconsin)
W73-05759

3E. Conservation in Industry

CHICAGO ALLIS MFG. CORP. V. METROPOLITAN SFANITARY DISTRICT OF GREATER CHICAGO (ACTION FOR DECLARATORY JUDGMENT THAT INDUSTRIAL WASTE ORDINANCE VIOLATED STATE AND EDERAL CONSTITUTIONS).

288 N.E.2d 436 (111. 1972).

Descriptors: *Illinois, *Waste disposal, *Discharge measurement, Assessments, Penalties (Legal), Sewage disposal, Waste water disposal, Disposal, Discharge (Water), Weirs, Flumes, Water measurement, Industrial wastes, Judicial decisions, Legal aspects, Constitutional law, Pollution abatement, Water pollution control.

Plaintiff industries, located within the defendant sanitary district's jurisdiction brought action for declaratory judgment contending that a provision of the Sanitary District Act and the Industrial Waste Surcharge Ordinance violated the Constitutions of Illinois and the United States. The challenged statute forbid industrial plants from discharging more than 3,650,000 gallons of aggregate waste, sewage and water into the district sewers in any twelve month period. The ordinance allowed industries to exceed the limit, but provided or the payment of a surcharge for doing so. Each plant was responsible for measuring its own waste subject to the surcharge, and was required to erect and maintain specific measuring devices at each sewer outlet. Plaintiff contended that the ordinance was unrelated to the police power and denies due process by forcing the use of expensive sampling equipment. The court upheld the ordinance, finding that a system for waste disposal is within the police power, since it was necessary for protecting public health. The court also found that the plaintiff's due process rights were not violated, because the waste sampling equipment was reasonably necessary for accomplishing the purpose of the ordinance. (Glickman-Florida)
W73-05242

A PRELIMINARY ESTIMATE OF THE ECONOMIC POTENTIAL OF MARINE PLACER MINING,
California Univ., Santa Barbara.
For primary bibliographic entry see Field 06B.
W73-05745

SYSTEMS DYNAMICS AS A TOOL FOR RESOURCE MANAGEMENT: ATLANTIC MENHADEN FISHERY CASE STUDY,
Massachusetts Inst. of Tech., Cambridge. Charles Stark Draper Lab.
For primary bibliographic entry see Field 06B.
W73-05746

THE CEMENT INDUSTRY: ECONOMIC IMPACT OF POLLUTION CONTROL COSTS, VOLUMES I AND II.
Boston Consulting Group, Inc., Mass.
For primary bibliographic entry see Field 05G.
W73-05761

THE LEATHER INDUSTRY: A STUDY OF THE IMPACT OF POLLUTION CONTROL COSTS, (VOLUMES I, II, AND III).
Urban Systems Research and Engineering, Inc., Cambridge, Mass.
For primary bibliographic entry see Field 05G.
W73-05762

3F. Conservation in Agriculture

STUDY OF WINTER WHEAT PHOTOSYNTHESIS UNDER CONDITIONS OF DIFFERENT WATER SUPPLY (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Institut Fiziologii Rastenii i Agrokhimii.
N. I. Goisa, B. A. Mitrofanov, A. S. Okanenko, G. I. Kutenko, and K. I. Makarenko.
Fiziol Biokhim Kul'Rast. Vol 3, No 4, p 392-397. 1971. Illus. English summary.
Identifiers: Leaf, *Photosynthesis, Water supply, *Wheat-M, Winter.

Photosynthetic studies were made of leaves, stems and spikes of winter wheat under the bogharic agricultural system and with irrigation in southern Ukraine. Leaf photosynthetic rate depended on the relative moisture of air of the plant cover (rpc) and productive stored soil moisture (W). A linear decrease in leaf photosynthesis occurred with an increase in leaf water deficit (dl), the latter being dependent on rpc and W. With a decrease in the 2 latter values dl increased and ds (water deficit of stems) did not change.--Copyright 1972, Biological Abstracts, Inc.
W73-05435

CONSTRUCTION OF IRRIGATION DISTRIBUTION SYSTEMS.
For primary bibliographic entry see Field 06E.
W73-05595

LIQUID SLUDGE DISPOSAL,
Niersverband, Viersen (West Germany).
For primary bibliographic entry see Field 05D.
W73-05635

OVERLAND FLOW HYDROGRAPH ANALYSIS TO DETERMINE INFILTRATION FUNCTION,
Hawaii Univ., Honolulu. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 02G.
W73-05721

SYSTEMS APPROACH TO DESIGN OF SPRINKLER IRRIGATION,
Hawaii Univ., Honolulu.
T. Liang, and I. P. Wu.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol 13, No 5, p 618-621, May 1970. 11 fig, 19 ref.

Descriptors: *Irrigation practices, *Sprinkler irrigation, Design criteria, Computer programs, Optimization.

A method of designing a solid set sprinkler system while optimizing the economy has been developed. The procedure is in the form of a digital computer program. The program is presented along with the procedure used in its development and method limitations. The program was tried on an actual design problem and the results are presented. (Skogerboe-Colorado State)
W73-05722

GRAIN SORGHUM RESPONSE TO NUMBER, TIMING, AND SIZE OF IRRIGATIONS IN THE SOUTHERN HIGH PLAINS,
Department of Agriculture, Bushland, Tex.
J. T. Musick, and D. A. Dusek.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol 14, No 3, p 401-404, March 1971. 2 fig, 2 tab, 11 ref.

Descriptors: *Irrigation practices, *Supplemental irrigation, Irrigation effects, Irrigation efficiency, *Sorghum, *Texas.
Identifiers: Irrigation timing, *Southern high plains.

A limited irrigation approach to irrigating grain sorghum in the Southern High Plains involved reducing (a) number of irrigations applied in relation to stage of plant development, and (b) size of irrigation. The study consisted of a 3-year detailed plot study and a 3-year graded furrow field test. The most efficient use of one 4-in. seasonal irrigation resulted from applying water at the heading stage. Plant moisture stress during vegetative development had less effect on yields than stress during heading. At higher water levels, irrigation during vegetative development became more important to obtaining high yields and efficient water use. Reducing size of seasonal irrigations from 4- to 2-in. reduced yields but increased irrigation water use efficiency. The average increase for 9 treatment year comparisons was from 335 to 511 lb. per acre-in. (Skogerboe-Colorado State)
W73-05723

RETURNED PROFITS.

Irrigation Age, Vol 4, No 9, p 20-21, April 1970. 8 fig.

Descriptors: *Water reuse, *Irrigation practices, Irrigation efficiency, Water conservation, Waste water, Water control, Water loss, Water pollution control, Irrigation engineering, *Return flow.

Identifiers: *Pump back systems, Irrigation automation, *Texas high plains.

Examples of the use of return water are presented. A return system with a storage capacity of 1 acre-foot and 1,296 feet of pipeline for the Texas high plains area costs $3,333.60. A return system is described. (Skogerboe-Colorado)
W73-05724

SIMULATION OF EXPECTED CROP RETURNS,
North Carolina State Univ., Raleigh. Dept. of Biological and Agricultural Engineering.
R. S. Sowell, T. Liang, and D. A. Link.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol 14, No 2, p 383-386, February 1971. 9 fig, 1 tab, 8 ref.

Descriptors: *Mathematical models, *Crop growth, *Farm management, Simulation analysis.
Identifiers: Farm operation, Machinery use.

Models of plant growth and the effects of farming operations are presented. These can be used to maximize the efforts of farm work. Two models were developed, namely a probabalistic and a simulation model. These are believed to be valuable tools in making farm management decisions. The models could be of great value in helping a farmer plan his year's operation. Theoretically, the two models are equally applicable to all situations, however, it was found that each model was more applicable to various situations. (Skogerboe-Colorado State)
W73-05726

EFFICIENCIES OF AN AUTOMATED SURFACE IRRIGATION SYSTEM WITH AND WITHOUT A RUNOFF RE-USE SYSTEM,
Nebraska Univ., Lincoln. Dept. of Agricultural Engineering.
P. E. Fischbach, and B. R. Somerhalder.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol 14, No 4, p 717-719, April 1971. 4 fig, 2 tab, 8 ref.

Descriptors: *Irrigation practices, *Irrigation systems, *Furrow irrigation, *Automation, Irrigation design, Irrigation engineering, Irrigation efficiency, *Water reuse.
Identifiers: Re-use system.

A furrow irrigation system with a pump back re-use system was tested. The coefficient of uniformity was found to be 91.8. The water application efficiency varied from 56.5 to 73 percent without the re-use system; while the efficiency with the re-use system varied from 84.4 to 96.8. The row spacings were 30 in. with a run length of 1100 ft. The irrigation time was controlled automatically at 2 hrs. and 15 min. It was concluded that: (1) An automatic surface irrigation system with a re-use system is very efficient. The re-use eliminated the labor needed to use a cut-back furrow stream. (2) Uniform water application can be accomplished using a furrow stream of three times the basic intake rate. (Skogerboe-Colorado State)
W73-05727

SCHEDULING FURROW IRRIGATION FOR PRACTICAL FARM OPERATIONS,
Soil Conservation Service, Lincoln, Nebr.
G. Woodward.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol 14, No 4, p 731-733, April 1971. 2 fig, 1 tab.

Descriptors: *Irrigation practices, *Furrow irrigation, Farm management, Infiltration, Irrigation design, Irrigation systems, Irrigation engineering.
Identifiers: Cuttback methods.

The large labor requirement necessary to operate a cutback furrow irrigation system is shown. The complexity and continual change in schedule caused irrigators to abandon the method completely and adopt a schedule that fit in with other farm work. Thus, the benefits of the cutback system were lost. Several modifications to the system are suggested and the equations necessary to calculate stream size and length of run are presented. With this method, it is possible to set up the system to be changed on even hours and the schedule repeats each day. The method is greatly simplified and more acceptable to irrigators. (Skogerboe-Colorado State)
W73-05728

GET DOUBLE USE OUT OF IRRIGATION WATER,
Agricultural Research Service, Kimberly, Idaho. Snake River Research Center.
J. A. Bondurant.
Idaho Farmer, Vol 88, No 6, p 24-27, March 1970.

Descriptors: *Water reuse, *Irrigation practices, Irrigation efficiency, Water conservation, Waste water, Water pollution control, Water loss, Irrigation engineering.
Identifiers: *Pump back systems, Irrigation automation.

The reuse of water is getting much attention in the United States today. One area that seems to show promise is that of recycling tailwater runoff in irrigated areas. By installing a collection pond and a pump back system irrigation efficiencies of 80 percent or greater are possible. By not allowing water to waste off the end of the field, the problem of silt and nutrient pollution in the streams could be greatly reduced. Also, in areas where urban development borders on agricultural land the legal problems associated with waste water could be eliminated. (Skogerboe-Colorado State)
W73-05729

THE APPROPRIATE GRADE OF A GATED PIPE,
South Dakota State Univ., Brookings. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 08B.
W73-05730

A PROCESS MODEL FOR COMPUTER CONTROL OF CROP GROWTH,
Hawaii Univ., Honolulu. Dept. of Agricultural Engineering.
M. R. Smith.
Transactions of the ASAE (American Society of Agricultural Engineering), Vol 14, No 3, p 475-479, March 1971. 6 fig, 2 tab, 7 ref.

Descriptors: Mathematical models, *Crop growth, Farm management, *Model studies, *Control, *Computer models, Simulation analysis.

Computer simulation of crop growth was studied. A model of crop growth was developed and tested. By using the computer to schedule farming operations it is felt that efforts could be maximized and production increased. Tests were conducted of plant growth control using growth chambers. Test data were collected over a large range of the pertinent variables: air temperature, leaf temperature, humidity, CO2 concentration, and radiation. Good results were obtained for predicting crop growth. (Skogerboe-Colorado State)
W73-05731

DESCRIPTION OF PHOTOSYNTHESIS WITHIN PLANT CANOPIES,
Kentucky Univ., Lexington. Dept. of Agronomy.
For primary bibliographic entry see Field 02I.
W73-05732

SALT RIVER PROJECT'S COMPUTERIZED IRRIGATION.

World Irrigation, Vol 20, No 6, p 17, Dember 1970. 1 fig.

Descriptors: *Irrigation practices, *Irrigation programs, Irrigation efficiency, Water conservation, Crop production, *Cotton.
Identifiers: *Irrigation scheduling, Irrigation research, Irrigation engineering, *Salt River project.

Irrigation scheduling research is being conducted on the Salt River Project. Sample soil cores are collected in the field and brought to the laboratory for analysis. The information is then fed into the computer. The result is a print-out that tells the farmer when and how much water to apply. Cotton yields have been increased by 250 pounds per acre. Water savings are reported in excess of 10 percent. Personal contact with the farmer has proven much more effective than mailing out the information. (Skogerboe-Colorado State)
W73-05733

PLANT WATER STATUS OF APPLE TREES AND ITS MEASUREMENT IN THE FIELD: VI. DIURNAL VARIATIONS IN THE WATER POTENTIAL OF APPLE LEAVES AND FRUITS OF THREE CULTIVARS AT TWO STRESS LEVELS,
Department of Primary Industries, Applethorpe (Australia). Granite Belt Horticulture Research Station.
K. R. Chapman.
Queensl J Agric Anim Sci. Vol 28, No 4, p 199-203, 1971, Illus.
Identifiers: Apple-D, Atmospheric conditions, Cultivars, Diurnal *Fruits, Indexing, Irrigation, Leaves, Measurement, Soils, Stress, Trees, *Water potential.

Diurnal measurements of water potential in apple leaves and fruits were made concurrently on 'Delicious,' Jonathan' and 'Granny Smith' cultivars. Compared with leaf water potentials, fruit potentials showed much less diurnal variation, and it seems that fruits may be able to exercise better control over water balance than leaves. Fruits do not seem to be a sensitive indicator of plant water stress, and therefore would seem to be of limited use for irrigation indexing. Apple fruit growth rate is not a sensitive indicator of plant water deficits. Factors which interact with soil and atmospheric variables such as variety, fruit size, maturity, crop loading, tree foliage display and the relationship between fruit and leaf potentials may influence the pattern of diurnal variations in fruits and leaves.--Copyright 1972, Biological Abstracts, Inc.
W73-05738

PLANNING NATURAL RESOURCE DEVELOPMENT, AN INTRODUCTORY GUIDE,
Economic Research Service, Washington, D.C.
For primary bibliographic entry see Field 06B.
W73-05741

FLOOD RISK AND AGRICULTURAL LAND VALUES: A TEST,
National Bureau of Economic Research, New York.
R. J. Struyk.
Water Resources Research, Vol 7, No 4, p 789-797, August 1971. 6 tab, 3 ref.

Descriptors: *Floods, *Risks, *Land use, *Value, Regression analysis, Agriculture, *Missouri River, Economics.
Identifiers: *Capitalized damages.

The usefulness of differential land values as a measure of capitalized flood damages to agricultural land is investigated. The general methodolog-

ical approach adopted is the use of a multiple linear regression model, since it permits the comparison of farms that are not strictly comparable in factors other than flood risk. The model's dependent variable is the per acre value of the farm without improvements. This value is assumed to be a function of a number of factors including absolute size of tract, acres of cropland, acres of pasture and woodland, quality of the soil, number of farm buildings and other improvements, other physical characteristics, and the risk of flooding. The estimated coefficient of a flood risk variable indicates the effect of a unit change in flood risk on the value per acre after the influence of all other independent variables in the model are taken into account. Data from three subareas on the Missouri River are used in the regression. The regression results indicated that a significant differential associated with flood risk exists between each of the flood-free areas and the flood-prone area. On the average, this differential is approximately $25 per acre. (Settle-Wisconsin)
W73-05748

SCIENCE, TECHNOLOGY, AND DEVELOPMENT, VOLUME III, AGRICULTURE.
For primary bibliographic entry see Field 06B.
W73-05750

TRANSFORMING IRRIGATION FROM AN AGE-OLD ART INTO A MODERN SCIENCE THROUGH RESEARCH AND TECHNOLOGY,
California Univ., Davis. Dept. of Irrigation.
For primary bibliographic entry see Field 06B.
W73-05751

EXTENDING UTILITY OF NON-URBAN WATER SUPPLIES,
Utah State Univ., Logan.
For primary bibliographic entry see Field 03B.
W73-05755

AN ECONOMIC ANALYSIS OF CENTER--PIVOT SPRINKLER SYSTEMS IN SOUTHEASTERN WYOMING, WITH EMPHASIS ON FINANCING ALTERNATIVES,
Wyoming Univ., Laramie. Div. of Agricultural Economics.
W. G. Wedemeyer.
M. Sc. Thesis, May 1972. 146 p, 4 fig, 29 tab, 54 ref. OWRR-A-002WYO (1).

Descriptors: *Economics, *Irrigation systems, *Sprinkler irrigation, *Farm management, *Cost-benefit analysis, *Economic feasibility, *Financial feasibility, *Wyoming, Financing, Planning, Evaluation, Value, Crop production, Rotations, Agriculture, Economic justification, Investment, Risks, Irrigation efficiency, Project planning, Government finance.

Economics and financing of center-pivot sprinkler irrigation systems were studied. Financing arrangements available and being utilized in Wyoming are described, and a feasibility analysis is carried out assuming various financing arrangements and crop plans. The concept of discounting is used in the analysis. Results show that the State is the major source of center-pivot sprinkler financing at the present time, its loans providing the most desirable financing alternatives available with the highest discounted present values. FHA loans are nearly comparable, but are available on to individuals unable to obtain adequate financing elsewhere. Results also indicate that an investment in a center-pivot sprinkler system is most profitable when a cash crop such as potatoes or sugar beets is included in the rotation irrigated by the system. Low present values were generated when only forage crops were included in the rotation. The analysis of economic feasibility for all the cropping plans in this study was based on the assumption that the land use displaced by the center-pivot system was dryland wheat production. The investment would possibly appear more profitable if the displaced use were assumed to be native pasture. (Black-Arizona)
W73-05764

EVAPOTRANSPIRATION OF IRRIGATED HIGH MOUNTAIN MEADOWS IN SOUTHERN WYOMING,
Wyoming Univ., Laramie. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02D.
W73-05765

EFFECT OF DIFFERENT NITROGENOUS FERTILIZERS IN RAINFED, RAGI,
University of Agricultural Sciences, Bangalore (India). Agronomy Div.
R. Ananthanarayana, K. Krishnamurthy, and L. A. Dixit.
Annals of Arid Zone, Vol 10, No 1, p 43-47, March 1971. 1 tab, 8 ref.

Descriptors: *Agronomy, *Nitrogen, *Fertilizers, *Fertilizton, *Crop response, *Nitrogen compounds, *Fertilization, Agriculture, Bioassay, Grains (Crops), Crop production, Application methods, Hydrogen ion concentration, Chemical analysis, Chemicals.
Identifiers: *India, *Ragi.

Earlier studies regarding beneficial effects of nitrogen fertilizers on rainfed ragi (Eleusine coracana Gaertn.) have been mainly confined to the use of ammonium sulphate. However, as other nitrogenous fertilizers become available, studies were undertaken from 1966 to 1968 with Ragi variety H22 under rainfed conditions at the University Farm, Bangalore to test the effects of continuous application of four types of nitrogenous fertilizers (Ammonium sulphate nitrate, ammonium sulphate, Urea, calcium nitrate) on grain yield at two dosage levels (33.3 and 100 kg/hectare). Entire dosage of fertilizers was supplied to soil at the time of transplanting. Calcium ammonium nitrate was the best source of nitrogen for increased ragi yields. Although the yields were maximum at 100 kg N, there appears to be no large benefit through increased grain yield of using 100 kg N/hectare as compared to 33.3 kg N/hectare. With calcium ammonium nitrate the original soil pH was increased to 6.6 from 5.1. (Black-Arizona)
W73-05767

THE EFFECT OF DEFOLIATION ON THE PERSISTENCE OF ATRIPLEX VESICARIA,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Plant Industry.
For primary bibliographic entry see Field 04A.
W73-05768

INFLUENCE OF THREE CUTTING SYSTEMS ON THE YIELD, WATER USE EFFICIENCY, AND FORAGE QUALITY OF SAINFOIN,
Colorado State Univ., Fort Collins. Dept. of Agronomy.
D. W. Koch, A. D. Dotzenko, and G. o. Hinze.
Agronomy Journal, Vol 64, No 4, p 463-467, July-August 1972. 2 fig, 6 tab.

Descriptors: *Crop production, *Water utilization, *Consumptive use, *Forage grasses, *Legumes, Efficiencies, Evapotranspiration, Drought resistance, Digestion, Colorado, Semiarid climates, Great Plains, Mature growth stage, Alfalfa, Proteins, Cattle, Plant growth regulators, Rainfall, Temperature, Wind velocity, Evaporation, Dry farming, Moisture stress, Calcium, Magnessium, Leaves, Cellulose, Lignings, Potassium.
Identifiers: *Sainfoin, *Cutting systems, Dry matter, Perennial grasses, Maturation, Stems, Hemicellulose, Cell wall constituents.

Though few perennial legumes are well adapted to the semiarid environmental conditions in the Central Great Plains, Sainfoin is one that compares well with alfalfa productivity, and contains similar available energy to meet protein requirements of beef animals. Sainfoin is a nonbloating, fairly drought-tolerant forage. Yield, water-use efficiency and forage quality are reported of sainfoin grown under climatic conditions that are typically semiarid and characterized by erratic rainfall, extremes in temperature, high average wind velocity, and high evaporation rates. Field experiments were performed at the Central Great Plains Field Station at Akron, Colorado, to determine the potential of Sainfoin as a dryland forage crop. Despite below-average rainfall, yields were 3,494 and 2,383 Kg/ha dry matter for 1969 and 1970, mostly produced by the first cutting. Water-use efficiency was high for the first, but low for the second cutting due to slow regrowth. Roots extracted soil moisture from 180 cm under late-season moisture stress due to prolonged drought. Survival rate over the 2-year period was lower for plants harvested consistently at the early bloom stage. Leaf, protein, and mineral percentages, cell wall components, and in vetro dry matter digestibility decreased little during maturing because of high retention of leaves and rapid maturation. Leaves had high percentages of protein, in vitro digestibility, Ca and Mg, and had lower percentages of cellulose, hemicellulose, lignin, cell wall constituents and K than stems. Sainfoin is an efficient water user and can survive moisture stress adequately. (Popkin-Arizona)
W73-05771

ESTABLISHMENT AND SURVIVAL OF PASTURE SPECIES FROM SEEDS SOWN ON THE SOIL SURFACE,
Commonwealth Scientific and Industrial Research Organization, Cnaberra (Australia). Div. of Plant Industry.
For primary bibliographic entry see Field 02I.
W73-05772

WATER USE BY SUGAR BEETS IN A SEMIARID ENVIRONMENT AS INFLUENCED BY POPULATION AND NITROGEN FERTILIZER,
North Dakota State Univ., Fargo. Dept. of Soils.
J. T. Moraghan.
Agronomy Journal, Vol 64, No 6, p 759-762, Nov-Dec 1972. 4 fig, 4 tab, 10 ref.

Descriptors: *Water utiliztion, *Sugar beets, *Semi-arid climates, *Dry farming, *Fertilizers, Nitrogen compounds, Plant populations, Crop production, Consumptive use, Root development, Plant growth regulators, Seasonal, Precipitation (Atmospheric), Water demand, Leaves, Nitrates, Soil-water-plant relationships.
Identifiers: Leaf area index (LAI), Sucrose.

Sugar beets (Beta vulgaris) are deep-rooting crops which seek moisture and are influenced by nitrogen (N) fertilizer. The decrease in the quality of American beets is of concern. The influence of population and N fertilizer on leaf area index (LAI) and on water use by beets under dry land conditions in a semi-arid environment is reported, as little is known of beets in these conditions. Growing season was characterized by long periods with little precipitation, where extensive use of stored soil moisture occurred to a depth of at least 183 cm. Populations of 26,400 and 70,700 plants/ha, and N fertilizer rates of 0, 56, 112 and 224 Kg/ha were observed. Higher population and fertilizer treatments increased water use by 9.5 and 3.5 percent, and yield of sucrose by 20 and 15 percent respectively. LAI increased much more markedly by both treatments. Greatest effect of increasing population on water use was most evident in the deepest depths from which soil moisture was utilized. Beets utilized soil nitrate to at least 152 cm. High yields under dry land conditions with limited precipitation was the result of

the deep rooting nature of sugar beets and relatively large amount of preplanting available stored soil moisture. (Popkin-Arizona)
W73-05773

REVOLUTIONARY DRIP IRRIGATION SYSTEM TO BE INTRODUCED IN UNITED STATES BY AGREEMENT WITH ISRAELI DEVELOPERS.

Citrus Industry, Vol 53, No 2, p 13-14, February 1972. 1 fig.

Descriptors: *Irrigation practices, *Irrigation systems, *Crop production, *Water conservation, Experimental farms, Water pollution sources, Fertilizers, Soil moisture, Vegetable crops, Marketing.
Identifiers: *Trickle irrigation, *Israel.

Trickle irrigation is widely used in Israel and the technology is being exported to the United States. The 'International Expert Panel Meeting on Irrigation' noted that the drip method is the world's advanced irrigation technique. Crop production may increase up to two times, and 30 percent less water is required. Ten years of intensive experience attest to the success of the method. Water conservation is highlighted. Trickle irrigation reduces migration of agricultural pollutants to streams and aquifers, and is especially effective in areas of sparse sandy soil and minimal rainfall. A fixed plastic network of fertilizer control head, main fillers and main pipes places water on soil as a mixture of water and fertilizer directly to plant roots. Regular irrigation at predetermined rates keeps soil moisture tension beneficially low while avoiding damage to leaves. Major successes are noted in Israel, Australia, South Africa, and Mexico under a variety of crops. Cucumbers, green peppers, oranges, grapes, strawberries, tomatoes, and melons are typical crops studied. Some marketing and equipment information is imparted. (Popkin-Arizona)
W73-05776

WATER, SALT PATTERNS WITH DESERT DRIP IRRIGATION,
California Univ., Riverside. Citrus Research Center and Agricultural Experiment Station.
For primary bibliographic entry see Field 03C.
W73-05781

EFFECT OF DROUGHTING AND CHILLING ON MATURATION AND CHEMICAL COMPOSITION OF TOWNSVILLE STYLO (STYLOSANTHES HUMILIS),
Commonwealth Scientific and Industrial Research Organization, St. Lucia (Australia). Cunningham Lab.
C. T. Gates, W. T. Williams, and R. D. Court.
Australian Journal of Agricultural Research, Vol 22, No 3, p 369-381, 1971. 6 fig, 5 tab, 16 ref.

Descriptors: *Chemical analysis, *Mature growth stage, *Drying, *Curing, *N .trients, *Range management, *Pasture management, *Dehydration, *Plant physiology, *Australia, Arid lands, Seasonal, Droughts, Plant growth, Plant growth substances, Nitrogen, Phosphorus, Grazing, Analytical techniques, Stress, Leaching, Fungi, Forage palatability.
Identifiers: *Chilling, Fodder, Amino acids, Leaf abscission.

In many parts of northern Australia, Townsville stylo provides useful fodder throughout the year despite the fact that its normal growing season may often be not more than 4 months' duration. Maturation of the plant is often hastened by dryness at the close of the wet season, or by chilling as autumn approaches. Little is known of the effects of drying or chilling on the composition of the plant or on leaf and seed shed. This study attempts to assess these effects on maturing plants in terms of growth, seed and leaf shed, nitrogen, phosphorus, and amino acid composition. Results indicate that the major effect is due to droughting which, under warm conditions, increases seed and leaf shed. Nutrient content of seed is raised, resulting in more of the plant's nitrogen and phosphorus being lost in these fractions. Droughting increased soluble nitrogen at the expense of protein nitrogen, but the amino acids fell as a proportion of the soluble and it was shown that proline and aspartic acid behaved atypically; while other amino acids fell, proline increased some 10-fold under drought or cold stress. These effects indicated that soluble nitrogenous components may both increase and change in composition in the maturing plant as a result of stress, thereby rendering the plant more susceptible under field conditions to leaching or breakdown caused by dew or slight showers of rain. (Black-Arizona)
W73-05786

PALAR . . . A NEW LOVEGRASS FOR THE SOUTHWEST,
Soil Conservation Service, Tucson, Ariz. Plant Materials Center.
R. J. Joy, R. D. Slayback, and C. W. Renney.
Progressive Agriculture in Arizona, Vol 24, No 5, p 4-5, September-October, 1972. 3 tab, 2 fig.

Descriptors: *Forage grasses, *Forage palatability, *Drought tolerance, *Adaptation, *Crop production, Deserts, *Southwest U.S., Experimental farms, Precipitation (Atmospheric), Elevation, Winter, Temperature, Seeds, Irrigation, Arid lands, Grazing.
Identifiers: *Palar, *Lovegrass, Digestibility, Stands, *South Africa.

Palar Wilman lovegrass (Eragrostis superba Peyr) is a native of South Africa, jointly released by the Agricultural Research Service, Soil Conservation Service and the University of Arizona for superior grazing, palatability, digestibility, and drought tolerance. Palar is adapted to desert grasslands of the southwest (10 to 16 inches total precipitation) below 4500 feet. Fair to good stands are maintained on an experimental site with as little as 9 inches total yearly precipitation. Palar may survive brief winter temperatures as low as 10 F. Seeding establishment and forage yield is superior to other lovegrasses, and is particularly productive under irrigation. Drought tolerance, superior performance, seed yields and grass description are outlined and tabulated. (Popkin-Arizona)
W73-05787

AGRICULTURAL RUNOFF--CHARACTERISTICS AND CONTROL,
Cornell Univ., Ithaca, N.Y. Dept. of Civil and Agricultural Engineering.
For primary bibliographic entry see Field 05B.
W73-05794

04. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control of Water on the Surface

DIVELY DRAINAGE AND LEVEE DISTRICT (DISTRICT 23), ILLINOIS (FINAL ENVIRONMENTAL IMPACT STATEMENT),
Army Engineer District, St. Louis, Mo.

Available from the National Technical Information Service as EIS-IL-72-4827-F, $5.00 in paper copy, $0.95 in microfiche. June 23, 1972. 53 p, 1 map.

Descriptors: *Environmental effects, *Illinois, *Levees, *Drainage systems, *Ditches, Flood protection, Flood control, Drainage, Excavation, Bank stabilization, Riprap, Bank protection, Levee districts, Earthworks, Distribution systems, Water spreading, Irrigation systems, Water control, Watershed management, Aesthetics.
Identifiers: *Environmental Impact Statements, *Fayette County (Illinois).

This project is designed to improve flood protection and interior drainage in the Dively Drainage and Levee District, Fayette County, Illinois. The project is located on the left bank of the Kaskaskia River between river miles 171.5 and 173.5 above the confluence of the Kaskaskia and Mississippi Rivers. The plan includes reconstruction of 3.5 miles of earth levee, construction of 3 gravity drains and collector ditches totalling 1,000 feet in length, and selectively riprapping the river's left bank. Reduction of the average area flooded annually will permit more efficient utilization of present agricultural soils and conversion of woodland within the District to cropland. The loss of woodland will have a permanent impact on wildlife habitats. 158 acres of cropland will be used for borrow sites and levee right of way. The borrow sites will be shaped to minimize aesthetic impacts and should rapidly revert to willow and cottonwood acreage. The riprapping material needed to stabilize the river banks will be excavated from the river banks. Invading vegetation over time will nullify the aesthetic impact of the riprap. (Beardsley-Florida)
W73-05222

CONSTRUCTION OF SABINE RIVER DIVERSION (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Economic Development Administration, Washington, D.C.
For primary bibliographic entry see Field 08A.
W73-05229

WATERSHED PROJECTS--1970.
For primary bibliographic entry see Field 06E.
W73-05230

CLARKS FORK-BULLOCKS CREEK WATERSHED, SOUTH CAROLINA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Washington, D.C.

Available from the National Technical Information Service as EIS-SC-72-4769-F, $3.00 in paper copy, $0.95 in microfiche. April 28, 1972. 17 p, 1 map, 2 tab.

Descriptors: *South Carolina, *Environmental effects, *Watershed management, *Flood protection, Flood control, Land management, Floods, Flood damage, Erosion control, Sediment control, Recreation, Impoundments, Non-structural alternatives, Water control, Water management (Applied).
Identifiers: *Environmental Impact Statements, *Clarks Forks-Bullock Creek Watershed (S.C.).

Project measures include a total of 17,600 acres of conservation land treatment supplemented by six floodwater retarding structures, and one multiple-purpose structure for flood prevention and recreation on the Clarks Fork-Bullocks Creek watershed located in north-central South Carolina in York County. In addition, approximately 360 acres of critically eroding land need treatment. The project will reduce erosion and sediment production by about 77 percent. Average annual acres flooded and average annual flood damages will be reduced considerably. The water quality in the streams will be improved. The project will also provide for recreation facilities. The project will eliminate a number of acres of woods, grassland and cropland, and 15 miles of stream fishery will be

eliminated by the impoundments. Both structural and nonstructural alternatives to the project were considered. (Nielsen-Florida)
W73-05235

SELECTIVE WITHDRAWAL FROM A TWO LAYERED FLUID,
Canterbury Univ., Christchurch (New Zealand). Dept. of Civil Engineering.
For primary bibliographic entry see Field 02E.
W73-05323

GROUNDWATER CONTAMINATION AND SINKHOLE COLLAPSE INDUCED BY LEAKY IMPOUNDMENTS IN SOLUBLE ROCK TERRAIN,
Missouri Geological Survey and Water Resources, Rolla.
For primary bibliographic entry see Field 05B.
W73-05331

HYDROLOGIC AND HYDRAULIC SIMULATION IN WATERSHED PLANNING AND PLAN IMPLEMENTATION,
Southeastern Wisconsin Regional Planning Commission, Waukesha.
For primary bibliographic entry see Field 06B.
W73-05345

OPTIMUM OPERATIONS MODEL FOR SHASTA-TRINITY SYSTEM,
Bureau of Reclamation, Sacramento, Calif. Mid-Pacific Regional Office.
For primary bibliographic entry see Field 06A.
W73-05347

OVERTOPPING OF SLOPE BREAKWATERS,
Laboratorio Nacional de Engenharia Civil, Lisbon (Portugal).
For primary bibliographic entry see Field 08B.
W73-05351

IMPROVED INLETS FOR HIGHWAY CULVERTS,
Federal Highway Administration, Washington, D.C.
For primary bibliographic entry see Field 08A.
W73-05376

A PHYSIOGRAPHIC SURVEY OF THE PONDEROSA PINE TYPE ON THE SALT-VERDE RIVER BASIN,
Arizona Agricultural Experiment Station, Tucson.
P. F. Ffolliott, D. L. Fisher, and D. B. Thorud.
Available from the National Technical Information Service as PB-214 699, $3.00 in paper copy, $0.95 in microfiche. Arizona Agricultural Experiment Station, Technical Bulletin 200, 1972. 60 p, 1 fig, 76 tab, 5 ref. OWRR A-029-Arizona (5). 14-31-0001-3503.

Descriptors: *Ponderosa pine trees, *Slopes, *Elevation, *Surveys, *Geomorphology, *Arizona, Multiple purpose, Land management, Sedimentary rocks, Igneous rocks, Metamorphic rocks, Geologic formations.
Identifiers: *Salt River Basin (Ariz.), *Verde River Basin (Ariz.), *Aspect.

Information from the ponderosa pine type on the Salt-Verde River Basin, Arizona, an important area of many natural resource products and uses, includes slope and aspect relationships, elevation characteristics, rock types (e.g., igneous, sedimentary, and metamorphic), geologic formations, ownership patterns. The information is organized into 76 tables to describe the Salt-Verde River Basin, the Salt River Basin, and the Verde River Basin as well as the smaller watersheds of Black River, White River, Beaver Creek, and West Clear Creek. Such information can be used by land management planners to assist in determining potential productivities of natural resource products and uses.
W73-05378

THE REEDY RIVER: CONFRONTING THE PROBLEMS OF AN URBAN WATERSHED,
Greenville County Planning Commission, S.C.
For primary bibliographic entry see Field 06F.
W73-05382

A SINGLE DEPARTMENT DEDICATED TO WATER RESOURCES MANAGEMENT,
Detroit Metro Water Dept., Mich.
For primary bibliographic entry see Field 06E.
W73-05385

A STUDY OF THE ANTELOPE VALLEY, THE SANTA CLARITA VALLEY, AND THE SAN GABRIEL MOUNTAINS OF LOS ANGELES COUNTY.
Los Angeles County Regional Planning Commission, Calif.
For primary bibliographic entry see Field 06B.
W73-05386

LOS ANGELES COUNTY PROGRAMS FOR WATER DISTRIBUTION, DRAINAGE CONTROL, SEWERAGE AND WATER RECLAMATION SYSTEMS, REFUSE FACILITIES.
Los Angeles County Regional Planning Commission, Calif.
For primary bibliographic entry see Field 06B.
W73-05387

SHORELINE RESOURCE DEVELOPMENT: A PRELIMINARY REPORT OF COASTAL MANAGEMENT AND LAND PLANNING FOR THE TAMPA BAY REGION.
Tampa Bay Regional Planning Council, St. Petersburg, Fla.
For primary bibliographic entry see Field 06B.
W73-05388

JOINT DISTRIBUTION FUNCTIONS FOR LINK LENGTHS AND DRAINAGE AREAS,
Thomas J. Watson Research Center, Yorktown Heights, N.Y.
J. S. Smart.
Available from NTIS, Springfield, Va 22151; AD-745 786 - Price $3.00 paper copy; $0.95 cents microfiche. IBM Research Report RC 3858, May 18, 1972. 22 p, 3 fig, 12 ref. ONR-GP Contract N00014-70-C-0188.

Descriptors: *Channel morphology, *Drainage area, *River basins, *Geomorphology, Mathematical models, Correlation analysis, Networks, Hydrologic data, Analytical techniques, Streamflow, Hydraulics, Forecasting.
Identifiers: Drainage networks, Link lengths, Random variables.

The elementary link lengths, L, and associated drainage areas, A, in drainage basins may be considered as correlated random variables drawn from a bivariate population. A theoretical model for the joint distribution is developed using the assumption that L and A depend in turn on other random variables, some of which they have in common. Some properties of the related quantities L/A and L sq/A are also derived, and some quantitative results that can be compared with observations on natural networks are obtained. (Woodard-USGS)
W73-05470

MONTE CARLO APPROACH TO SEEPAGE IN JOINTED ROCK,
Notre Dame Univ., Ind. Dept. of Civil Engineering.
For primary bibliographic entry see Field 08E.
W73-05478

OBSERVATIONS ON CONTROL OF FISTIA STRATIOTES LINN. IN FISH PONDS BY 'GRAMOXONE,'
Central Inland Fisheries Research Inst., Cuttack (India). Fisheries Research Station.
For primary bibliographic entry see Field 05C.
W73-05548

OPERATION OF THE NEWBURGH LOCK AND DAM, NEWBURGH, INDIANA.
For primary bibliographic entry see Field 06E.
W73-05592

WATERSHED PROJECTS--1972: TEKAMAH--MUD CREEK, NEBRASKA; SUGAR RIVER, NEW HAMPSHIRE; EIGHTEEN MILE CREEK, SOUTH CAROLINA.
For primary bibliographic entry see Field 06E.
W73-05593

FOUR MILE RUN--ALEXANDRIA, VIRGINIA: SOURIS RIVER--MINOT, NORTH DAKOTA.

Hearing--Subcomm. on Flood Control--Comm. on Public Works, U.S. House of Representatives, Ninety-first Congress, July 14, 1970. 24 p, 1 map.

Descriptors: *Flood protection, *Economic justification, *Flood control, *Channel improvement, Levees, Dam construction, Earthworks, Floodwalls, Water management (Applied), River basin development, Water policy, Administration, Planning, Streamflow, River control, Floods.
Identifiers: *Congressional hearings.

The Subcommittee on Flood Control considered two projects for recommendation for authorization pursuant to section 201 of the 1965 Flood Control Act. First, the Four Mile Run project which lies mostly within Arlington County, Virginia and the city of Alexandria, Virginia. Four Mile Run has steep slopes combined with a narrow width making a 'flashy' stream in which increased urban runoff from rainfall has caused periodic flooding and associated property damage since 1963. Appearing before the Subcommittee to recommend a project of channel improvements, levees, and floodwalls were interested government officials. The second project was the Souris River flood project. This project will provide needed protection to the city of Minot, North Dakota through a two unit plan of channel improvements and a dam and reservoir on the Souris River. Local officials urged the project's recommendation since the 1969 flood caused 12.5 million dollars of flood losses. The Corps of Engineers also recommended the authorization of both projects. (Beardsley-Florida)
W73-05608

VERMILION HARBOR, ERIE COUNTY, OHIO (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Buffalo, N.Y.
For primary bibliographic entry see Field 08A.
W73-05609

STREAM CHANNELIZATION, PART I.
For primary bibliographic entry see Field 06E.
W73-05616

STREAM CHANNELIZATION, PART II.
For primary bibliographic entry see Field 06E.
W73-05617

STREAM CHANNELIZATION, PART 3.
For primary bibliographic entry see Field 06E.
W73-05618

SEASONAL AND DIURNAL CHANGES IN MOISTURE CONTENTS AND WATER DEFICITS OF ENGELMANN SPRUCE NEEDLES,
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 02I.
W73-05650

WATER AVAILABLE IN CANALS AND SHALLOW SEDIMENTS IN ST. LUCIE COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 04B.
W73-05683

INVESTIGATION OF ICE CONDITIONS IN ARCTIC SEAS AND METHODS OF FORECASTING AND COMPUTATION (ISSLEDOVANIYE LEDOVOGO REZHIMA ARKTICHESKIKH MOREY I METODY PROGNOZOV I RASCHETOV).
Arkticheskii i Antarkticheskii Nauchno-Issledovatelskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 02C.
W73-05702

METHODS OF FORECASTING LONG-TERM VARIATIONS IN ICE COVERAGE OF THE GREENLAND SEA (O MNOGOLETNEY IZMENCHIVOSTI LEDOVITOSTI GRENLANDSKSOGO MORYA I METHODIKE YEYE PROGNOZA),
Arkticheskii i Antarkticheskii Nauchno-Issledovatelskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 02C.
W73-05705

EFFECT OF VEGETAL LENGTH AND SPATIALLY VARIED FLOW ON VELOCITY DISTRIBUTION COEFFICIENTS,
Department of Agriculture, Stillwater, Okla.
For primary bibliographic entry see Field 08B.
W73-05720

EFFICIENCIES OF AN AUTOMATED SURFACE IRRIGATION SYSTEM WITH AND WITHOUT A RUNOFF RE-USE SYSTEM,
Nebraska Univ., Lincoln. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 03F.
W73-05727

SCHEDULING FURROW IRRIGATION FOR PRACTICAL FARM OPERATIONS,
Soil Conservation Service, Lincoln, Nebr.
For primary bibliographic entry see Field 03F.
W73-05728

PLANNING NATURAL RESOURCE DEVELOPMENT, AN INTRODUCTORY GUIDE,
Economic Research Service, Washington, D.C.
For primary bibliographic entry see Field 06B.
W73-05741

THE ECONOMIC SIGNIFICANCE OF THE RHINE-MAIN-DANUBE WATERWAY,
European Economic Commission, Geneva (Switzerland).
For primary bibliographic entry see Field 06B.
W73-05757

THE EFFECT OF DEFOLIATION ON THE PERSISTENCE OF ATRIPLEX VESICARIA,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Plant Industry.
J. H. Leigh, and W. E. Mulham.
Australian Journal of Agricultural Research, Vol 22, No 2, p 239-244, 1971. 4 fig, 7 ref.

Descriptors: *Grazing, *Browse utilization, *Range management, *Resistance, Livestock, Shrubs, Soil moisture, Plant growth, *Australia, Sheep, Plant morphology, Erosion control, Arid lands, Drought resistance.
Identifiers: Grazing pressure, Growth inhibitors, *Defoliation, *Saltbush (Bladder).

The perennial shrub Atriplex vesicaria (bladder saltbush) occurs over much of arid and semiarid Australia and is highly regarded as a drought-resistant browse plant as well as a valuable bush for checking soil erosion. However, the plant is very susceptible to overgrazing. In order to assess the influence of 'overgrazing', bushes were grazed by Merino sheep to two levels of defoliation: severe and complete. Effect of season and moisture were also investigated by grazing separate groups of plots in October and February at two different soil moisture levels. Results showed that the more heavily the bushes were grazed the less likely they wer to regenerate. Completely defoliated bushes did not regrow, irrespective of soil moisture status or season. It is hypothesized that the inability of A. vesicaria to persist after complete or severe grazing is due to the removal, by grazing, of potential growth sites which apparently occur only along the young stems. (Black-Arizona)
W73-05768

EFFECTS OF SALTS ON SEED GERMINATION OF SOME DESERT GRASSES,
Central Arid Zone Research Inst., Jodhpur (India).
For primary bibliographic entry see Field 03C.
W73-05769

A SELECTED AND ANNOTATED BIBLIOGRAPHY OF UNDERSTORY-OVERSTORY VEGETATION RELATIONSHIPS,
Arizona Univ., Tucson. Dept. of Watershed Management.
P. F. Ffolliott, and W. P. Clary.
Arizona Agricultural Experiment Station, Tucson, Technical Bulletin 198, October 1972. 33 p, 262 ref.

Descriptors: *Bibliographies, *Forest management, *Watershed management, *Reviews, *Canopy, *Forests, *Environmental effects, *Cutting management, *Succession, Abstracts, Soil-water-plant relationships, Natural resources, Control, Management, Data collections, Publications, Microenvironment, Light intensity, Air-earth interfaces, Evaporation, Evapotranspiration, Coniferous forests, Deciduous forests, Mixed forests, Balance of nature.

Purpose of this bibliography is to provide a summary of selected literature on understory-overstory relationships, published through 1971. It is intended to be a working tool for natural resources specialists attempting to describe (a) understory production, density, composition and other factors, associated with overstories of varying densities and compositions, or (b) changes in these understory characteristics resulting from conversion or modification of overstories. References include popular as well as scientific articles which can generally be found readily available sources. Annotations include (a) identification of major plant species, if given, (b) location of study area, and (c) form of data presentation (e.g. tables, graphs, etc.). The bibliography is organized into five different categories: (1) coniferous, (2) deciduous, (3) mixed coniferous-deciduous, (4) shrub, and (5) other. An index of authors is included to facilitate use. (Black-Arizona)
W73-05770

ESTABLISHMENT AND SURVIVAL OF PASTURE SPECIES FROM SEEDS SOWN ON THE SOIL SURFACE,
Commonwealth Scientific and Industrial Research Organization, Cnaberra (Australia). Div. of Plant Industry.
For primary bibliographic entry see Field 02I.
W73-05772

STRUCTURE AND ENERGETICS OF 3 MINNESOTA FORESTS,
Dartmouth Coll., Hanover, N.H. Dept. of Biological Sciences.
For primary bibliographic entry see Field 02I.
W73-05775

PALAR . . . A NEW LOVEGRASS FOR THE SOUTHWEST,
Soil Conservation Service, Tucson, Ariz. Plant Materials Center.
For primary bibliographic entry see Field 03F.
W73-05787

UNCONSOLIDATED MATERIALS, HARTFORD NORTH QUADRANGEL, CONNECTICUT,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W73-05803

LOSS OF INFORMATION BY DISCRETIZING HYDROLOGIC SERIES,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 07C.
W73-05806

MAP SHOWING AREAS OF PAST FLOODING IN THE PARKER QUADRANGLE, ARAPAHOE AND DOUGLAS COUNTIES, COLORADO,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W73-05807

ECOLOGICAL CHARACTERISTICS OF ARISTIDA LONGISETA AND AGROPYRON SPICATUM IN WEST-CENTRAL IDAHO,
Soil Conservation Service, Pocatello, Idaho.
For primary bibliographic entry see Field 02I.
W73-05845

4B. Groundwater Management

INTERSTATE WATER COMPACT; WELL DRILLING.
For primary bibliographic entry see Field 06E.
W73-05239

RECORDS OF SELECTED WATER WELLS AND TEST HOLES IN THE OKLAHOMA PANHANDLE,
Geological Survey, Oklahoma City, Okla.
For primary bibliographic entry see Field 07C.
W73-05294

RECORDS OF HYDROLOGIC DATA, WALTON COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 07C.
W73-05295

DEVELOPMENT AND UTILIZATION OF THERMAL WATERS IN HUNGARY,
Research Inst. for Water Resources Development, Budapest (Hungary).
L. Belteky.
Geothermics (Italy), Vol 1, No 3, p 103-112, September 1972. 8 fig, 3 tab, 7 ref.

Descriptors: *Geothermal studies, *Thermal water, Enthalpy, Hydrothermal studies, Hydrogeology, Water temperature, Water resources development, Heat flow.
Identifiers: *Hungary.

The utilization of thermal waters and the conditions of thermal well development in Hungary are reviewed. The locations of thermal wells in the three important fields of use are described. One of the most important problems is elimination of the precipitation of salts together with scaling control. In addition, the importance of measurements in the wells and their scientific and practical advantages are also mentioned. (Knapp-USGS)
W73-05298

OCCURRENCE AND QUALITY OF GROUND WATER IN CRYSTALLINE ROCKS OF THE LLANO AREA, TEXAS,
West Virginia Geological and Economic Survey, Morgantown.
R. A. Landers, and L. J. Turk.
Ground Water, Vol 11, No 1, p 5-10, January-February 1973. 3 fig, 6 tab, 17 ref.

Descriptors: *Hydrogeology, *Water yield, *Texas, Aquifer characteristics, Water quality, Permeability, Transmissivity, Weathering, Water wells, Groundwater.
Identifiers: *Llano (Texas).

Median yield of wells in crystalline rocks of the Llano area of Texas is 14 gpm. Near the Highland Lakes the median yield is somewhat higher (17 gpm) because of continuous recharge from the lakes. The yield per saturated foot of aquifer decreases with depth because weathering, porosity, and permeability decrease with depth and because fractures close with depth. Optimum depth of wells in the area is 75 to 100 feet. It is commonly more economical from the standpoint of well yield to drill several shallow wells rather than one deep well. Quality of groundwater is generally good, but erratic, with median concentrations (in mg/liter) of Si, 49; SO4, 61; Cl, 83; NO3, 21; Fe, 0.07; and total hardness, 302. Schist generally yields water with higher total hardness and sulfate concentrations than other rock types. The water samples with high nitrate concentrations typically are from wells near septic systems or livestock pens. (Knapp-USGS)
W73-05303

QUALITY OF NEAR-SURFACE WATERS IN SOUTHERN ILLINOIS,
Southern Illinois Univ., Carbondale. Dept. of Geology.
R. W. Davis.
Ground Water, Vol 11, No 1, p 11-18, January-February 1973. 10 fig, 1 tab, 26 ref.

Descriptors: *Water chemistry, *Water quality, *Hydrogeology, *Geochemistry, *Illinois, Variability, Distribution patterns, Hardness (Water), Aquifer characteristics, Data processing, Statistical methods, Groundwater basins.
Identifiers: *Trend surface analysis.

The 'ring average' method of generating trend surfaces was applied to water chemistry data from shallow water wells in southern Illinois. The method is a slight modification of a well-known geophysical technique. Basically the method acts as a filter which removes anomalies with dimensions smaller than the diameter of the ring. The trend maps generated by the technique are presented and discussed. Between the Salem-Woodward structural block and the Wabash Valley Fault Zone, water chemistry shows marked changes. Analysis of these changes suggests that this is a zone of upward moving waters from deep stratigraphic units. The process of reverse osmosis filtration explains some observed phenomena. (Knapp-USGS)
W73-05304

PHYSICS OF BRINE CONING BENEATH SKIMMING WELLS,
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
B. M. Sahni.
Ground Water, Vol 11, No 1, p 19-24, January-February 1973. 2 fig, 7 ref.

Descriptors: *Saline water-freshwater interfaces, *Hydrogeology, *Encroachment, *Groundwater movement, *Withdrawal, Safe yield, Mixing, Water chemistry, Water quality.
Identifiers: Skimming wells.

Brine rises beneath a discharge well partially penetrating an unconfined aquifer in which fresh water is underlain by saline water. To predict the maximum uncontaminated fresh water production for given aquifer conditions and well geometry, the potential distribution in the flow region must be known. Because the partial differential equation describing the flow is nonlinear as are the boundary conditions, it is not possible to arrive at an exact analytic solution to the problem. Therefore, a less rigorous but tractable approach is to solve this problem using simplifying and physically plausible assumptions. The approximate analytic solutions available are reviewed and the validity of the assumptions used is evaluated. Factors affecting the stability of the brine cone beneath a skimming well and conditions leading to entrainment of salt water along with fresh water production are also discussed. (Knapp-USGS)
W73-05305

DETERMINING WEDGE ANGLE FOR A WEDGE AQUIFER,
Department of the Environment, Ottawa (Ontario). Inland Waters Branch.
A. Vanden Berg, and D. H. Lennox.
Ground Water, Vol 11, No 1, p 25-31, January-February 1973. 6 fig, 2 tab, 5 ref.

Descriptors: *Hydrogeology, *Aquifer characteristics, *Aquifer testing, *Drawdown, Groundwater movement, Withdrawal, Equations, Observation wells, Data collections.
Identifiers: *Wedge aquifers.

Analysis of drawdown data from either the pumped well or an observation well in a horizontal, wedge-shaped aquifer yields the distances from the well to the four nearest image wells. These results may be used, in the case of pumped-well data alone, to determine the wedge angle. If only observation-well data are used, eight possible positions of the wedge can be determined. A combination of pumped-well and observation-well data further reduces the number of possible wedge configurations to two, which are each other's mirror image in the line through the wells. Only additional geologic or hydrologic information can distinguish between these two to delineate the aquifer area completely. (Knapp-USGS)
W73-05306

SINKHOLE FURNISHES EMERGENCY WATER SUPPLY,
Watson and Co., Tampa, Fla. Dept. of Civil Engineering.
J. L. Carter, Jr.
Water and Sewage Works, Vol 120, No 1, p 44-46, January 1973. 1 fig, 3 photo.

Descriptors: *Karst hydrology, *Sinks, *Withdrawal, *Groundwater resources, *Water yield, Karst, Florida, Water quality, Water resources development.
Identifiers: *Tampa (Fla).

A limestone sinkhole a few miles northeast of Tampa, Florida, was tested for use as a source of emergency water supply for the city. In the course of the 27-day pumping test, more than 150 million gal of water were pumped from the sinkhole into the Hillsborough River, which supplies fresh water for Tampa. The pumped-out water was quickly replaced from the surrounding aquifer. No significant lowering of the water table occurred. The pump was capable of pumping up to 7.2 mgd of water. Throughout the pumping, the water level of the sinkhole generally held steady at about -5.5 feet below the pre-pumping level. Measurements were made at two other wells and sinkhole, 800 to 1000 feet distant from the Watson Sinkhole. Drawdown was from 0.5 to 1.6 feet. The total alkalinity range was 130 to 161 ppm as CaCo3. Total hardness was 178-260 ppm, with pH ranging from 7.30 to 7.85. Turbidity was 1 to 12 Jackson units. Total dissolved solids ranged from 232 to 340 ppm. The sinkhole is about 245 feet deep. It has an hourglass configuration, narrowing to a point about 25 feet down, then widening out again toward the bottom. (Knapp-USGS)
W73-05314

INTERFERENCE BETWEEN PARTIALLY PENETRATING WELLS IN AN ARTESIAN AQUIFER,
Indian Inst. of Tech., Kharagpur. Dept. of Civil Engineering.
S. N. P. Sharma.
Journal of Hydraulic Research, Vol 10, No 4, p 447-474, 1972. 12 fig, 4 tab, 10 ref.

Descriptors: *Artesian aquifers, *Steady flow, *Drawdown, *Artesian wells, Potentiometric level, Water yield, Analog models, Equations.
Identifiers: *Well interference, Partially penetrating wells.

Simplified expressions are given for average pressure distribution around a partially penetrating well under steady state of flow in an artesian aquifer for small and large values of radial distance from the well center. Discharge may be computed for small groups of partially penetrating wells having different well arrangements within a circular exterior boundary. Explicit expressions for the discharge and the interference effects are presented in terms of relatively simple parameters. Analytical results are tested with experimental values obtained by three-dimensional continuous electrical analog models. Results of numerical examples for an infinite set of wells, placed in an array within a rectangular exterior boundary, are compared with analytical work, and close agreement is observed. (Knapp-USGS)
W73-05322

GROUNDWATER CONTAMINATION AND SINKHOLE COLLAPSE INDUCED BY LEAKY IMPOUNDMENTS IN SOLUBLE ROCK TERRAIN,
Missouri Geological Survey and Water Resources, Rolla.
For primary bibliographic entry see Field 05B.
W73-05331

GROUND-WATER AVAILABILITY IN THE WHITE RIVER JUNCTION AREA, VERMONT,
Geological Survey, Montpelier, Vt.
A. L. Hodges, Jr., and D. Butterfield.
Addendum to report 'A Rural Comprehensive Water and Sewer Plan for Windsor County, Vermont, 1969': Vermont Department of Water Resources, 1972. 27 p, 11 fig, 3 tab, 7 ref.

Descriptors: *Groundwater resources, *Test wells, *Water supply, *Aquifer characteristics, *Vermont, Observation wells, Pumping, Water yield, Water quality, Groundwater recharge, Hydrogeology, Transmissivity, Specific capacity, Planning, Well data.
Identifiers: *Windsor County (Vermont).

A study of the groundwater resources of the White River Junction area, Windsor County, Vermont, was begun in 1969 to provide technical appraisal of potential sources of water to meet the expanded

needs of towns in the county Test work was carried out in 3 phases. The first was seismic refraction profiling at several locations to determine the shape, thickness, location, and type of materials below the surface of the land. The second phase was subsurface sampling with auger and wash borings to determine the permeability of the subsurface materials. Observation wells, 1 1/4 inches in diameter, were installed in auger or wash-bore holes at four locations that were found to have potential for development as municipal water supplies. These small-diameter wells served as observation wells during the third phase of the program, during which an 8-inch well was constructed at each of the four locations and the aquifer tested. The 4 test wells, finished with wire-wrapped screen, were pumped until the pumped water was virtually sand-free, assuring good well efficiency during testing. After the wells were developed, 3 of the wells were pumped for 48 hours, and drawdown and recovery were measured in the pumping well and at least one observation well. Aquifer test data are described for 11 sites. (Woodard-USGS)
W73-05332

NITRATE AND NITRITE VARIATION IN GROUND WATER,
Wisconsin Dept. of Natural Resources, Madison.
For primary bibliographic entry see Field 05B.
W73-05335

POSITIVE OPTIONS FOR SAN ANTONIO'S FUTURE WATER QUALITY.
Citizens for a Better Environment, San Antonio, Tex.; American Association of Univ. Women, San Antonio, Tex.; Sierra Club (South Texas Group), San Antonio; and League of Women Voters, San Antonio, Tex.

May 1, 1972. 24 p, 25 ref, 3 append.

Descriptors: Groundwater, *Groundwater recharge, Urbanization, *Aquifer, Regulation, Zoning, Easements, Legal aspects, Water quality control, Texas.
Identifiers: *San Antonio, Edwards Aquifer, Subdivision regulations.

The problems of uncontrolled urban development in groundwater recharge areas are discussed. San Antonio and large areas of South Texas depend on the Edwards Underground Aquifer. Recently there has been a proposal to develop a new town in the recharge zone for this aquifer. Such a major urban development would impair the quality of the water for much of the South Texas region and have a negative impact on the general environmental quality of the area. Various local agencies' responsibilities in preventing the deterioration of the aquifer are discussed and four alternative courses of action are offered: (1) protect the quality of the surface waters that flow over the recharge zone; (2) stop all development in the recharge zone until detailed studies and plans can be made; (3) implement a regulatory or guidance system to control urbanization on the recharge zone; (4) purchase much of the land or land rights in the zone. Some detailed outlines of legal authority and alternative controls such as zoning, subdivision regulations, and utility easements are also included. (Elfers-North Carolina)
W73-05389

PRELIMINARY RESULTS OF INJECTING HIGHLY TREATED SEWAGE-PLANT EFFLUENT INTO A DEEP SAND AQUIFER AT BAY PARK, NEW YORK,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 05B.
W73-05471

WATER RESOURCES IN THE NORTHERN SAHARA,
P. Pallas.
Nature and Resources (Bulletin of IHD), Vol 8, No 3, p 9-17, July-September 1972. 1 fig.

Descriptors: *Water resources development, *Foreign countries, *Arid lands, *Irrigation, *Groundwater resources, Water yield, Artesian aquifers, Costs, Water supply, Planning, Methodology, Reviews.
Identifiers: *North Africa, Sahara Desert.

The Algerian-Tunisian Sahara has all the water it needs to guarantee agricultural development far exceeding the present 45,000 hectares of oases which utilize 750 million cu m of water per year. The limiting factor in the exploitation of an additional 50 to 100,000 hectares of land is not water; rather, it is the admissible values of the investment to which governments are willing to consent and the practical possibilities of making such water produce returns through suitable types of cultivation. Within this global hypothesis of development, the 1971-80 period would have the following economic implications: the investment of 300 million Algerian dinars and 10 million Tunisian dinars solely for water production; an increase in the cost of water at an average of 25% in Algeria and 50% in Tunisia. (Woodard-USGS)
W73-05484

EVALUATION OF YIELDS OF WELLS IN CONSOLIDATED ROCKS, VIRGINIA TO MAINE,
Geological Survey, Washington, D.C.
D. J. Cederstrom.
Available from GPO, Washington, D.C. 20402 Price - 65 cents (paper cover). Geological Survey Water-Supply Paper 2021, 1972. 38 p, 2 plate, 1 tab, 49 ref.

Descriptors: *Aquifers, *Water yield, *Estimating, *Water wells, *Northeast U.S., Methodology, Evaluation, Hydrologic data, Aquifer characteristics, Pumping, Drawdown, Test wells, Groundwater recharge, Statistical methods, Geology, Well data.
Identifiers: *North Atlantic region.

In the North Atlantic region, Virginia to Maine, yields of industrial and municipal wells are the most reliable indicators of the water-yielding potential of consolidated rocks. Generally, such wells are 350 to 500 feet deep and utilize 60 to 150 feet of drawdown. In multiple-well developments, average yields of wells per 100 feet of drawdown range from less than 75 gallons per minute in the least favorable rocks such as shale or granite gneiss to as much as 300 gpm in limestone. In any one rock type, substantially greater than average sustained yields are possible in structurally deformed areas or in areas where recharge potential is especially favorable. Methods are described in evaluating the average yield of multiple wells in consolidated formations where a maximum supply of water is desired. The estimates refer to the average yield of five wells drilled in the formation. (Woodard-USGS)
W73-05493

ELECTRIC ANALOG MODEL STUDY OF THE UPPER WHITE RIVER BASIN, INDIANA,
Geological Survey, Indianapolis, Ind.
R. W. Maclay, and J. E. Heisel.
Geological Survey Open-file Report, 1972. 27 p, 9 fig, 7 ref.

Descriptors: *Groundwater movement, *Hydrologic properties, *Analog models, *Indiana, River basins, Hydrologic data, Correlation analysis, Water yield, Groundwater recharge, Pumping, Drawdown, Transmissivity, Hydraulic properties, Aquifers, Hydrogeology, Water resources development, Planning.
Identifiers: *Upper White River Basin (Ind).

The groundwater reservoir consisting of glacial deposits of the upper White River basin in Indiana is a major source of water for municipal and industrial uses. Investigation of the reservoir and of its responses to various development schemes is an essential prerequisite to managing the groundwater resource. An electric analog model of the groundwater reservoir was developed for water utilization planning. Investigations were carried out in two stages. First, during a calibration phase the pattern of water-level distribution in the regional reservoir was approximated, and simulated base-flow hydrographs were compared with those derived from hydrograph analysis. Second, after the calibration was completed the model was used to investigate the effects of pumpage, principally in Marion County. Experience gained through the construction of the model indicates that transmissivity values can be reasonably estimated from geologic data and well drillers' records; however, water-level data and an accurate knowledge of boundary conditions, particularly along stream-course discharge areas, are essential. (Woodard-USGS)
W73-05495

WATER IN ST. JOHN, U.S. VIRGIN ISLANDS,
Geological Survey, Washington, D.C.
O. J. Cosner.
Geological Survey Caribbean District open-file report, 1972. 46 p, 18 fig, 13 tab, 21 ref, append.

Descriptors: *Water resources, *Virgin Islands, *Groundwater resources, *Rain water, *Water quality, Cisterns, Aquifer characteristics, Water yield, Water utilization, Water wells, Groundwater recharge, Well data, Hydrologic data, Surface waters, Chemical analysis, Rainfall, Ephemeral streams.
Identifiers: *St John (Virgin Islands).

Groundwater occurs in significant but limited quantities in the fractured volcanic rock throughout most of St. John Island, U.S. Virgin Islands. Yield of wells in this aquifer ranges from less than 100 to about 2,000 gpd. The average long-term yield of the three drilled wells in use by the National Park Service in 1967 was about 1,000 gpd. Yield of 1,000 to 5,000 gpd may be expected in the Coral Bay and the Reef Bay areas. Estimated total recharge of the fractured volcanic rock is 1,000,000 to 3,000,000 gpd. Perhaps as much as a quarter to a third of this water could be developed practically, depending on the rainfall in a given year. The chemical quality of the groundwater in the fractured-rock aquifer in areas uncontaminated by sea water ranges from 600 to 2,000 mg/liter dissolved solids. Water from formations in the higher altitudes is of better quality than that in the lower formations. There are no perennial streams on St. John. Rainwater collected in cisterns from roofs and catchments yields about 50 gpd per 1,000 square feet of catch area during anaverage year of rainfall. This is the main method of water supply for domestic use. (Woodard-USGS)
W73-05496

PLANNING, TESTING, AND DESIGN FOR WATER RECLAMATION FOR LOS ANGELES,
Los Angeles Dept. of Water and Power, Calif.
For primary bibliographic entry see Field 05D.
W73-05583

THEORETICAL STUDY OF DISPERSION IN A FRACTURED ROCK AQUIFER,
Northwestern Univ., Evanston, Ill. Technological Inst.
For primary bibliographic entry see Field 05B.
W73-05675

WATER AVAILABLE IN CANALS AND SHALLOW SEDIMENTS IN ST. LUCIE COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla.
H. W. Bearden.

Florida Bureau of Geology Report of Investigations No 62, 1972. 50 p, 23 fig, 4 tab, 16 ref.

Descriptors: *Water resources development, *Groundwater resources, *Canals, *Florida, *Irrigation, Water wells, Aquifer characteristics, Pumping, Water yield, Groundwater recharge, Water quality, Salinity, Chlorides, Pesticides, Agriculture, Saline water intrusion, Water level fluctuations, Drawdown, Transmissivity, Permeability, Hydrologic data, Flood control, Rainfall.
Identifiers: *St. Lucie County (Fla).

The development of land for agricultural use in much of St. Lucie County, Fla., has decreased surface and groundwater storage and greatly increased the irrigation needs. The canal network of the Central and Southern Florida Flood Control District constitutes the major supplier of irrigation water in the county. The supply is replenished by rainfall and groundwater inflow. For example, the rate of groundwater inflow to the canals ranges from 0.3 to 2.76 cfs per mile per foot of drawdown in the canal. The shallow sediments are generally of low permeability. The coefficient of transmissivity of these materials ranges from 10,000 to 53,000 gpd per foot. Because of the low permeability of the upper 20 feet of the shallow sediments and the low rates of recharge to the canal network, the development of shallow groundwater supplies will be required to meet irrigation needs during dry periods. Wells 6 inches or more in diameter developed in the zone 40 to 100 feet below land surface would probably yield 100 to 200 gpm. The salinity of canal water increases during prolonged dry periods as the mineralized artesian water that is used for irrigation seeps into the canals. (Woodard-USGS)
W73-05683

PRELIMINARY APPRAISAL OF GROUND-WATER CONDITIONS IN THE VICINITY OF MODESTO, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
R. W. Page.
Geological Survey Open-file Report, October 2, 1972. 44 p, 22 fig, 6 tab, 26 ref.

Descriptors: *Groundwater resources, *Water wells, *Water quality, *Water yield, *California, Hydrologic data, Aquifer characteristics, Well data, Pumping, Water level fluctuations, Groundwater movement, Geology, Chemical analysis, Water analysis, Water utilization, Water supply.
Identifiers: *Modesto (Calif).

The city of Modesto incorporates about 12 sq mi along and near the Tuolumne River in the northeastern part of the San Joaquin Valley, California. Agriculture is the mainstay of the economy of the city. Annual rainfall averages about 12 inches and most of it occurs from October through May. Water for the city and the immediate area is supplied from 45 city wells, 49 wells owned by a private water company, and many privately owned domestic and industrial wells. Younger alluvium of Holocene age and older alluvium of Pleistocene and Holocene age crop out within and near the city. Interbedded with the older alluvium is the Corcoran Clay Member of the Pliocene and Pleistocene Tulare Formation that functions as a confining bed. Groundwater occurs in the semiconfined water body in the older alluvium above and east of the Corcoran and in the confined water body in the older alluvium and older rocks and deposits beneath the clay. Water-level contour maps indicate that water in the semiconfined water body is moving toward Modesto and that the Tuolumne River is both a losing and a gaining stream in the area. There was a/moderately rapid decline in water levels from 1959 to 1961. Since 1962 water levels have remained fairly constant. Most of the water is of a calcium, calcium sodium, or calcium magnesium bicarbonate type. (Woodard-USGS)
W73-05689

GROUND-WATER LEVELS IN THE UNITED STATES, 1966-70, SOUTHWESTERN STATES.
Geological Survey, Washington, D.C.

Available from GPO, Washington, DC 20402 Price 50 cents (paper cover). Geological Survey Water-Supply Paper 2010, 1972. 106 p, 6 fig.

Descriptors: *Groundwater, *Water levels, *Observation wells, *Water utilization, *Aquifer characteristics, Basic data collections, Arizona, California, Hawaii, Nevada, New Mexico, Water wells, Water level fluctuations, Water table, *Southwest US.

Groundwater levels, aquifer characteristics, and water utilization are presented for observation wells in Arizona, California, Hawaii, Nevada, and New Mexico for the period 1966-1970. This basic network contains observation wells so located that the most significant data are obtained from the fewest wells in the most important aquifers. Each well is identified by a local number that is provided for continuity with older reports and for other use as dictated by local needs, and a code number that is based on the universal system of latitude and longitude. Water-level measurements are given in feet with references to either mean sea level or land-surface datum. (Woodard-USGS)
W73-05692

WATER SOLUBLE ORGANIC SUBSTANCES LEACHABLE FROM FEEDLOT MANURE,
Agricultural Research Service, Fort Collins, Colo.
For primary bibliographic entry see Field 05B.
W73-05783

SOIL HYDROLOGY IN A SEMIARID WATERSHED,
Agricultural Research Service, Weslaco, Tex.
P. R. Nixon, G. P. Lawless, and R. L. McCormick.
American Society of Agricultural Engineers, Transactions, Vol 15, No 5, p 985-991, 1972. 6 fig, 3 tab, 12 ref.

Descriptors: *Soil investigations, *Soil moisture, *Soil-water-plant relationships, *Groundwater recharge, *Soil moisture meters, *Soil water movement, Hydrology, Arid lands, Watershed management, Soil management, Water yield improvement, Brush control, Soil profiles, *California, Chaparral, Precipitation (Atmospheric), Infiltration, Percolation, Root zone, Unsaturated flow, Moisture availability.

Soil hydrology studies in central coastal California (near Lompoc) indicate that groundwater recharge occurs from on-site precipitation. Changes and redistributions of moisture in deep sandy profiles at four naturally vegetated upland sites were studied. Following the summer dry season, the winter rain water penetrates as a wetting front. This water does not reach the bottom of the root zone every year; hence, recharge is intermittent. During a 10-year study, the water-year precipitation ranged from 7 to 31 inches at four sites. The resulting penetration of rain water ranged from 2.5 to more than 19 feet, the maximum depth of sampling. Natural recharge occurred once under chamise brush (Adenostoma fasciculatum), twice under coastal live oak (Quercus agrifolia), three times under grass-weed, and four times under a canyon oak thicket (Quercus wislizenii). Variations are mainly due to precipitation, soil, and climate characteristics rather than vegetation type at the various sites. Extrapolation of the results at these four sites suggests that a typical naturally vegetated site in the sandy area contributes to recharge on the average of once every 7 years. Conversion of vegetation from brush and trees to grass is felt to be of questionable value in increasing water yields in this low rainfall area. (Black-Arizona)
W73-05785

OCCURRENCE OF SHALLOW SALTY GROUND WATER IN SELECTED AREAS OF WEST VIRGINIA,
Federal Water Pollution Control Administration, Wheeling, W. Va. Ohio Basin Regin.
For primary bibliographic entry see Field 05B.
W73-05800

MAP SHOWING GROUND-WATER POTENTIAL IN THE ASPEN QUADRANGLE, PITKIN COUNTY, COLORADO,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W73-05802

BIBLIOGRAPHY OF GROUNDWATER STUDIES IN NEW MEXICO.
For primary bibliographic entry see Field 02F.
W73-05819

CHEMICAL COMPOSITION OF DEEP FORMATION WATERS IN SOUTHWESTERN LOUISIANA,
Tulsa Univ., Okla.
For primary bibliographic entry see Field 02K.
W73-05821

NITRATE CONCENTRATIONS IN GROUNDWATER BENEATH A BEEF CATTLE FEEDLOT,
Agricultural Research Service, Gunnison, Colo. Soil and Water Conservation Research Div.
For primary bibliographic entry see Field 05B.
W73-05823

METHODS OF FLOW MEASUREMENT IN WELL BORES,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 08B.
W73-05825

REGULATORY ASPECTS OF LIQUID WASTE INJECTION INTO SALINE AQUIFERS,
Missouri Univ., Rolla.
For primary bibliographic entry see Field 05G.
W73-05828

EFFECT OF WATER WELL EFFICIENCY ON COST.
Universla Oil Products, St. Paul, Minn. Johnson Div.

Bulletin 472, April 1972. Johnson Division, Universal Oil Products Company, St. Paul, Minnesota. 3 p.

Descriptors: Wells, Water wells, *Water costs, Pumping, Efficiencies, *Well screens, *Economic efficiency, Economics, Drawdown, Specific capacity, Maintenance costs, Fuel, Cost analysis.
Identifiers: Nomograms, Incrustation.

Two types of cost are involved in obtaining a supply of water from a well: 1) The direct pumping cost for power (operating cost); and 2) Indirect cost arising from the investment in (capital cost) and maintenance cost of the well and pumping system. Both types of cost are influenced by the design and construction of the well and pump. Formulas are given whereby direct costs for power can be calculated, whether the power source is electricity or liquid hydrocarbon fuel. Maintenance expenses and life span of the well are important factors in indirect cost. The principal causes of maintenance expenses and short life are corrosion, incrustation, and sand-pumping. Proper choice of construction materials will limit corrosion, and correct design will reduce incrustation and sand-pumping. (Campbell-NWWA)
W73-05829

GOOD WATER CAN RUIN YOUR WELL,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 08G.
W73-05831

4C. Effects on Water of Man's Non-Water Activities

WATER QUALITY CHARACTERISTICS OF STORM SEWER DISCHARGES AND COMBINED SEWER OVERFLOWS,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 05B.
W73-05333

EFFECT OF URBAN DEVELOPMENT ON FLOODS IN THE PIEDMONT PROVINCE OF NORTH CAROLINA,
Geological Survey, Raleigh, N.C.
A. L. Putnam.
Open file report, 1972. 87p, 26 fig, 9 tab.

Descriptors: *Urban runoff, Peak discharge, *Urbanization, Watetsheds, Flood data, *Flood forecasting, Time lag, Hydrologic equation, Hydrologic data, North Carolina.
Identifiers: Charlotte, Durham, Lenoir, Morganton, Winston-Salem, Piedmont, *Impervious land cover.

The study relates peak discharges on selected streams in North Carolina to drainage area, stream length, stream slope, and percent of the basin covered by impervious surfaces. The relationships are based on an analysis of flood information from approximately 200 sites in the Piedmont area of the state and apply to streams that are unaffected by artificial storage or diversion. The relationships can be used to estimate peak discharges in basins of varying degrees of urbanization; the users of the equations must supply the actual values for basin in question, e.g. drainage area and amount of impervious land cover. The study found that as a basin changes from rural to urban the basin lag time can decrease to as little as one-sixteenth of what it was originally and that the peak discharge may increase by as much as a factor of five. (Elfers-North Carolina)
W73-05381

FLOOD PLAINS AND REGIONAL GROWTH: A SUGGESTED POLICY FOR THE SAN ANTONIO-BEXAR COUNTY AREA.
San Antonio-Bexar County Area Policy Council, Tex.
For primary bibliographic entry see Field 06F.
W73-05383

CHATTAHOOCHEE CORRIDOR STUDY.
Atlanta Regional Commission, Ga.

Available from the National Technical Information Service, $3.00 in paper copy, $0.95 in microfiche. Completion Report, July, 1972. 80 p, 34 fig, append. HUD CPA-GA-04-04-1000.

Descriptors: *Water quality, *Cities, Land use, Recreation, *Urbanization, Zoning, Erosion, Stream erosion, *Planning, *Erosion control, Soil erosion, *Land management, Flood plains, *Flood plain zoning, Runoff, Georgia.
Identifiers: *Atlanta, *Chattahoochee River, *Land use impact analysis, Land use vulnerability analysis, River corridor plan, Flood hazard zone, Development guidelines, Land use plan, Implementation plan, Flood plain regulation.

A planning methodology and an implementation strategy are outlined for guiding and controlling urban development in the Chattahoochee River Corridor, which covers a 48 mile reach directly upstream from Atlanta and extending 2,000 feet on each side of the stream. It is assumed that this area will become urbanized but that through planning and guidance the adverse environmental impacts can be minimized. The primary goal is the preservation of the water quality of the river. A key element of the planning methodology is an analysis of factors affecting water quality, e.g. runoff and erosion. The analysis includes a land vulnerability study in which the shoreland is analyzed in terms of its soils, land cover, slope, geology, and hydrology in order to assess probable impacts from urban development. The key elements of the resulting plan for the corridor and of the implementation strategy are the minimization of bridge crossings, provision of regional water and sewerage systems, preservation of vulnerable lands for open space and recreation, local programs to control soil erosion, local flood plain regulations, and the use of planned unit urban developments. (Elfers-North Carolina)
W73-05384

4D. Watershed Protection

WATERSHED PROJECTS--1970.
For primary bibliographic entry see Field 06E.
W73-05230

WATERSHED PROJECTS--1972: TEKAMAH--MUD CREEK, NEBRASKA; SUGAR RIVER, NEW HAMPSHIRE; EIGHTEEN MILE CREEK, SOUTH CAROLINA.
For primary bibliographic entry see Field 06E.
W73-05593

FOUR MILE RUN--ALEXANDRIA, VIRGINIA: SOURIS RIVER--MINOT, NORTH DAKOTA.
For primary bibliographic entry see Field 04A.
W73-05608

CONSENTING TO THE KANSAS-NEBRASKA BIG BLUE RIVER COMPACT.
For primary bibliographic entry see Field 06E.
W73-05612

GEOMORPHOLOGY OF THE MIDDLE LUNI BASIN OF WESTERN RAJASTHAN, INDIA,
Central Arid Zone Research Inst., Jodhpur (India).
For primary bibliographic entry see Field 02J.
W73-05774

05. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification of Pollutants

EFFECT OF WATER QUALITY ON FIRST--YEAR MORTALITY OF LARGEMOUTH BASS,
Cornell Univ., Ithaca, N.Y. Water Resources and Marine Sciences Center.
For primary bibliographic entry see Field 05C.
W73-05203

CONCENTRATION AND ANALYSIS OF PESTICIDES AND OTHER RECALCITRANT MOLECULES IN WATER SUPPLIES BY ULTRAFILTRATION (REVERSE OSMOSIS),
Cornell Univ., Ithaca, N.Y. Water Resources and Marine Sciences Center.
For primary bibliographic entry see Field 05F.
W73-05205

IMPROVED GAS CHROMATOGRAPHIC METHOD FOR FIELD MEASUREMENT OF NITROUS OXIDE IN AIR AND WATER USING A 5A MOLECULAR SIEVE TRAP,
Max-Planck-Institut fuer Chemie, Mainz (West Germany).
J. Hahn.
Analytical Chemistry, Vol 44, No 11, p 1889-1892, September 1972. 2 fig, 8 ref.

Descriptors: *Water analysis, *Sea water, *Gas chromatography, Separation techniques, Laboratory equipment, Adsorption, Nitrogen compounds, Instrumentation, Air, Atlantic Ocean, On-site tests.
Identifiers: *Nitrous oxide, Shipboard measurements, Precision.

The method of analyzing N2O in air and water by adsorbing on 5A molecular sieves and transferring the collected sample to a gas chromatographic column by means of a Toepler pump has been modified to eliminate the pump. The modified system for water samples employs a 6-liter glass bulb fitted with a gas inlet tube and a condenser. The condenser is connected to an absorption train of four U-shaped tubes containing: (1) sodium hydroxide, (2) sodium asbestos, (3) P205, (4) 5A molecular sieves. The system operates by evacuation, raising the pressure to 1 atm with clean nitrogen carrier gas, evacuating, introducing a water sample, and again raising the pressure to 1 atm with the nitrogen. The 6-liter bulb is heated and after 1 hour of operation the molecular sieve tube is closed and stored for GC analysis of N2O. The N2O is transferred from the sieve tube by attaching it to the gas sampling value of a gas chromatograph with a thermal conductivity detector, heating to 350 C, and reabsorbing it on the stainless steel column containing 35/70 mesh 5A molecular sieves. This method was used to measure N2O contents in air and seawater over the Atlantic Ocean in 1969. Analysis of results showed that they were reliable. (Little-Battelle)
W73-05244

DETERMINATION OF TRACE AMOUNTS OF SELENIUM IN WASTEWATERS BY CARBON ROD ATOMIZATION,
Los Angeles County Sanitation District, Whittier Calif. San Jose Creek Water Quality Lab.
R. B. Baird, S. Pourian, and S. M. Gabrielian.
Analytical Chemistry, Vol 44, No 11, p 1887-1889, September 1972. 6 tab, 13 ref.

Descriptors: *Waste water (Pollution), *Pollutant identification, *Sewage effluents, Trace elements, Iron, Aluminum, Chromium, Copper, Manganese, Nickel, Molybdenum, Heavy metals, Water pollution, Water analysis.
Identifiers: *Selenium, *Carbon rod atomization, *Atomic absorption spectrophotometry, Chemical interference, Precision, Detection limits, Sample preparation, Sensitivity, Chemical digestion.

A carbon rod atomizer-equipped atomic absorption spectrophotometer was adapted for determining picogram quantities of selenium in wastewaters. In the adaptation of these techniques to wastewater analysis, a nitric-perchloric acid digestion of the samples was used to oxidize organic material and solubilize the Se before injection into the carbon rod. The absolute detection limits (signal:noise equals 2) experimentally determined for Se standards and wastewater samples were 26 and 33 picograms, respectively. The experimentally determined sensitivity (1 percent absorption) for stock selenium was 32 picograms. The sensitivity of the carbon rod for wastewaters containing selenium in a nitric acid-perchloric acid matrix was 50 picograms. The relative standard deviation for the peak absorption signal calculated from ten injections of 50 ng of selenium (0.5 microliter of 1 microgram/ml solution) was 3.5 percent. The accuracy of the procedure, including sample digestion, is exhibited by an 88 percent average recovery (relative error of 12 percent) from various spiked wastewater samples. The ef-

fects of the dissolved solids in concentrations normally found in domestic wastes were demonstrated by increasing their concentrations with respect to a fixed selenium concentration. The recovery results imply that this type of matrix does not significantly interfere (within the limits of the procedure) with the atomization or absorbance of selenium in the carbon furnace. As a further check, it was demonstrated that a 1000-fold excess (w/w) of Al, Cr, Cu, Mn, Ni, and Zn did not interfere with the absorption at the 196.0 nm resonance line of selenium. Similarly, a 600-fold excess of Fe and Mo, and a 150-fold excess of Bi, Pb, and V exhibited no interference at the selenium resonance line. (Long-Battelle)
W73-05245

DETERMINATION OF SCANDIUM BY PRECIPITATION WITH BENZILIC ACID,
Wayne State Univ., Detroit, Mich. Dept. of Chemistry.
M. H. Mullin, and R. B. Hahn.
Analytical Chemistry, Vol 44, No 11, p 1878-1879, September 1972. 2 tab, 10 ref.

Descriptors: *Chemical analysis, *Chemical precipitation, *Aqueous solution, *Gravimetric analysis, Cations, Anions, Hydrogen ion concentration, Organic acids, Separation techniques, Iron, Fluorides, Sulfates, Aluminum, Magnesium, Lead, Tracers, Radioactivity techniques, Chemical reactions, Titanium, Organic compounds.
Identifiers: *Scandium, *Benzilic acid, Chemical interference, Zirconium, Sc-46, Scandium radioisotopes, Perchlorates, Uranyl, Zirconyl, Yttrium, Niobium, Thorium, Lanthanum, Tellurium, Sample preparation, Mandelic acid.

Benzilic acid has been tested to determine if it is more suitable as a quantitative precipitant for scandium determinations than mandelic acid. A known amount of Sc was precipitated with benzilic acid at pH 2.5. The precipitate was digested at 75-80C for about 20 min, cooled to room temperature, filtered and washed, and dried for ignition to scandium oxide. Complete recoveries were obtained in the pH range of 1.5-5.0. The composition of the precipitate was determined to be a hydrated scandium tribenzilate which is deemed unsuitable for direct weighing due to variations in the degree of hydration (0.5-3 moles of water/mole of scandium tribenzilate depending on temperature and length of drying). Using Sc-46 as a tracer, the solubility of scandium tribenzilate was 8.4 micromoles/l. Interference by diverse anions and cations was found to be negligible. Since Sc does not precipitate with Zr at high acid concentrations, but Zr does accompany Sc in precipitation from weakly acid solutions, an initial separation of Zr from a Sc-Zr mixture is required prior to the determination of Sc. The efficiency of the separation was determined using scandium-46 tracer and the study showed that the separation of scandium from zirconium using benzilic acid is quantitative. Because scandium tribenzilate is about one-tenth as soluble as scandium trimandelate and is easier to handle, benzilic acid is the preferred reagent for the gravimetric determination of Sc. (Long-Battelle)
W73-05246

ACIDIMETRIC TITRATION OF HEAVY METAL ACETATES,
M. G. Mannens.
Analytical Chemistry, Vol 44, No 11, p 1876-1877, September 1972. 3 fig, 1 tab, 8 ref.

Descriptors: *Volumetric analysis, *Heavy metals, Cobalt, Nickel, Copper, Zinc, Cadmium, Mercury, Lead, Organic compounds.
Identifiers: *Acetates, *Potentiometric titration, Silver, Recovery, Cobalt.

Experiments showed that heavy metal acetates can be titrated potentiometrically in HOAc if an excess of cetyltrimethylammonium bromide is added to the solution. The result is explained by assuming the formation of a sparingly dissociated metal bromide. Samples of Co, Ni, Cu, Ag, Zn, Cd, Hg, and Pb were dissolved in acetic acid and automatically titrated by this method. The results compare favorably with other titration procedures. The method can also be used to differentiate mixtures of alkali or alkaline earth metal acetates from heavy metal acetates in acetic acid medium. (Little-Battelle)
W73-05247

APPARATUS FOR AUTOMATED GEL PERMEATION CLEANUP FOR PESTICIDE RESIDUE ANALYSIS. APPLICATIONS TO FISH LIPIDS,
Bureau of Sport Fisheries and Wildlife, Columbia, Mo. Fish-Pesticide Research Lab.
R. C. Tindle, and D. L. Stalling.
Analytical Chemistry, Vol 44, No 11, p 1768-1773, September 1972. 2 fig, 3 tab, 12 ref.

Descriptors: *Automatic control, *Pesticide residues, *Chemical analysis, *Laboratory equipment, Heptachlor, Chlorinated hydrocarbon pesticides, DDT, DDD, Dieldrin, Endrin, Performance, Fish, Methodology.
Identifiers: *Cleanup, *Gel permeation chromatography, Biological materials, Chemical recovery, Detection limits, Lindane, Cis-chlordane, Trans-chlordane, Electron capture gas chromatography, Precision, Sample preparation, Biological samples, Tissue.

The gel permeation cleanup procedure for fish and other tissue extracts in pesticide residue analysis, previously reported by Stalling, Tindle, and Johnson, has been automated. The atuomated system allows unattended operation while processing up to 23 samples with the system as described. Reproducibility of recoveries were quite good (coefficient of variation 5 percent) and cross-contamination was estimated at less than 1 percent. The chromatography system was constructed from commercially available components so that other investigators may easily duplicate the device without the necessity for fabrication of special components. (Long-Battelle)
W73-05248

INFLUENCE OF COLUMN CONFIGURATION ON PERFORMANCE IN HIGH EFFICIENCY LIQUID CHROMATOGRAPHY.
Northeastern Univ., Boston, Mass. Dept. of Chemistry.
For primary bibliographic entry see Field 02K.
W73-05249

HIGH PERFORMANCE LIQUID CHROMATOGRAPHY ON SMALL PARTICLE SILICA GEL,
Varian Aerography, Walnut Creek, Calif.
For primary bibliographic entry see Field 02K.
W73-05250

THE RENAISSANCE IN POLAROGRAPHIC AND VOLTAMMETRIC ANALYSIS,
Princeton Applied Research Corp., N.J. Chemical Instrument Corp.
For primary bibliographic entry see Field 02K.
W73-05251

SEPARATION OF THORIUM FROM LANTHANUM AND OTHER ELEMENTS BY CATION EXCHANGE CHROMATOGRAPHY AT ELEVATED TEMPERATURES,
National Chemical Research Lab., Pretoria (South Africa).
F. W. E. Strelow, and A. J. Gricius.
Analytical Chemistry, Vol 44, No 11, p 1898-1900, September 1972. 3 fig, 4 tab, 15 ref.

Descriptors: *Temperature, *Separation techniques, Chemical analysis, Aqueous solutions, Pollutant identification, Heavy metals.
Identifiers: *Cation exchange chromatography, *Thorium, *Lanthanum, Zirconium, Rare earth elements, Ion exchange resins, Chemical recovery, Cation distribution coefficients.

Cation exchange chromatography is used to separate thorium from lanthanum and other elements at elevated temperatures. Specific amounts of dry resin and thorium or lanthanum or zirconium are equilibrated, and the resin is separated by filtration. The elements in both resin and solution are determined at elevated temperatures by cation exchanged chromatography. Recoveries of lanthanum and thorium utilizing this method are excellent. This investigation indicates that all elements except hafnium and zirconium and those which do form insoluble precipitates in the eluting agent either as insoluble chlorides or by hydrolysis should be separated from thorium by the described procedure. (Byrd-Battelle)
W73-05252

STUDY OF COBALT (III) COMPLEXES BY ATOMIC ABSORPTION SPECTROMETRY. EFFECT OF LIGANDS AND DISTRIBUTION OF ATOMIC COBALT IN THE FLAME,
Tokyo Univ. (Japan). Dept. of Agricultural Chemistry.
K. Fujiwara, H. Haraguchi, and K. Fuwa.
Analytical Chemistry, Vol 44, No 11, p 1895-1897, September 1972. 5 fig, 17 ref.

Descriptors: *Cobalt, Chemical analysis, Distribution, Pollutant identification, Aqueous solutions, Heavy metals, Chemical reactions.
Identifiers: *Ligands, *Atomic absorption spectrophotometry, *Metal complexes, *Chemical interference, Absorbance.

The interference effects of ligands on Co (III) complexes were investigated by atomic absorption spectrometry. A diluted sample solution of cobalt metal and aqueous solutions of representative Co (III) complexes were prepared by standard methods. Their purities were examined by elementary analyses for the ligands and iodometric and EDTA titrations for Co. The 2432 A analytical line of cobalt was used for all measurements for the air-acetylene flame. The dependence of atomic absorption on the acetylene flow rate in the air-acetylene and nitrous oxide-acetylene flames was measured by varying the acetylene flow rate with constant flow rates of air (131/min) and nitrous oxide (61/min). The distributions of cobalt atoms in the flame were obtained by measuring absorbance at thirty different positions in the flame, successively moving the burner with the adjusting screw. The cobalt (II) solutions were used as the reference in all experiments. The atomic absorption of cobalt complexes seem to vary in a regular order due to the kinds of the coordinating atoms of the ligands. The type of chemical bond that forms between the cobalt and ligand may be a determining factor of the interference effect, since the observed signals can be classified according to them. (Byrd-Battelle)
W73-05253

CALCIUM OXALATE CRYSTALS IN THE ARAGONITE-PRODUCING GREEN ALGA PENICILLUS AND RELATED GENERA,
Florida State Univ., Tallahassee. Dept. of Biological Science.
For primary bibliographic entry see Field 05C.
W73-05254

PARTICULATE BIOLUMINESCENCE IN DINOFLAGELLATES: DISSOCIATION AND PARTIAL RECONSTITUTION,
Johns Hopkins Univ., Baltimore, Md. McCollum-Pratt Inst.
For primary bibliographic entry see Field 05B.
W73-05255

EXTRACTIVE PHOTOMETRIC DETERMINATION OF URANIUM (VI) IN MINE WATERS (EXCHANGE OF EXPERIENCE),
Rostov-on-Don State Univ. (USSR).
G. G. Shchemeleva, Yu. V. Stepanenko, and P. N. Kovalenko.
Industrial Laboratory, Vol 37, No 12, p 1837, December 1971. 1 tab. Trans. from Zavodskaya Laboratoriya, Vol 37, No 12, p 1431, Dec. 1971.

Descriptors: *Photometry, *Mine water, *Water analysis, *Pollutant identification, Separation techniques, Cations, Chemical reactions, Anions, Chemical analysis, Methodology, Heavy metals.
Identifiers: *Uranyl, Sensitivity, Brilliant Green, Chemical interference, Detection limits, Uranium, Benzoic acid.

The reaction between the benzoic acid complexed anion of uranium and Brilliant Green was investigated and has been used for determining uranyl in mine water, without preliminary concentration, with Ur concentrations from 0.0002 g/l upwards. When the method was checked with solutions of pure uranyl salts, the experimental error did not exceed 4 percent; sensitivity was 0.054 microgram/ml. Chemical interference studies revealed practically no interference by alkaline earth metal ions at concentrations at which they are likely to occur in mine waters. Ferric ions interfered, but could be reduced to the ferrous ion by ascorbic acid. (Holoman-Battelle)
W73-05257

SCHEME OF ANALYZING PRODUCTS OF MICROBIOLOGICAL TRANSFORMATION OF AROMATIC HYDROCARBONS (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Inst. of Biochemistry and Physiology of Microorganisms.
L. V. Andreyev, L. A. Golovlyova, Z. I. Finkelstein, and G. K. Skryabin.
Prikladnaya Biokhimiya i Mikrobiologiya, Vol 8, No 1, p 75-81, January/February 1972. 5 fig, 1 tab, 12 ref.

Descriptors: *Isolation, *Chemical analysis, *Microbial degradation, Biodegradation, Metabolism, Cultures, Fungi, Yeasts, Gas chromatography, Aromatic compounds, Pollutant identification, Separation techniques, Organic acids.
Identifiers: *Nocardia corallina, *Aromatic hydrocarbons, Substrate utilization, Dicarboxylic acids, Thin layer chromatography, Xylene, Biotransformation, Monocarboxylic acids, Metabolites, Sample preparation.

An optimal acheme is presented for analyzing biosynthetic products to be used in isolation and selection of microorganisms transforming aromatic hydrocarbons into mono- and dicarboxylic acids. Fractionation and identification of biosynthetic products can be performed by microthin-layer chromatography on ammonium oxide as well as by gas chromatography. The data obtained through analysis of products of xylene transformation by the cultures Nocardia sp. strain IA and Nocardia coralline 77A are presented to illustrate the advantages of the scheme. (Long-Battelle)
W73-05258

MEASUREMENT OF NITRATES AND NITRITES IN THE CULTURE SOLUTION (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Inst. of Biochemistry and Physiology of Microorganisms.
M. M. Buzlanova, V. G. Leonova, and L. G. Chervina.
Prikladnaya Biokhimiya i Mikrobiologiya, Vol 8, No 1, p 82-85, January-February 1972. 3 tab, 7 ref.

Descriptors: *Nitrates, *Nitrites, *Aqueous solution, *Methodology, Cultures, Colorimetry, Volumetric analysis, Anions, Separation techniques, Pollutant identification.
Identifiers: *Culture media, Detection limits, Experimental error.

The procedure of measuring nitrate- and nitrite-ions in the case of their simultaneous presence in the culture liquid on the Munz medium is described. The procedure is based on the colorimetric measurement of nitrites with the Griss reagent and the titrimetric determination of nitrates. Optimal conditions for measuring these ions in the culture liquid are defined. The measurable concentrations of nitrate are within the range of 0.001-3 mg/ml and those of nitrite in the range of 0.01-1.5 mg/ml, the error being plus or minus 15 percent. (Holoman-Battelle)
W73-05259

THEORETICAL EVALUATION OF THE ELEMENTAL BALANCE DURING MICROBIAL CULTIVATION ON N-ALKANES AND N-ALCOHOLS (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Inst. of Biochemistry and Physiology of Microorganisms.
I. G. Minkevich, G. P. Popkov, and V. K. Eroshin.
Prikladnaya Biokhimiya i Mikrobiologiya, Vol 8, No 2, p 160-166, March/April 1972. 2 fig, 1 tab, 13 ref.

Descriptors: *Microorganisms, *Biomass, *Mathematical studies, Cultures, Oxygen requirements, Nutrient requirements, Ammonia, Oxygen demand, Mathematical models, Organic compounds, Alcohols, Carbon, Evaluation, Bioassay, Nitrogen compounds, Essential nutrients, Measurement, Equations, Microbiology, Pollutant identification, Hydrogen.
Identifiers: *Nutrient balance, Culture media, n-alkanes, n-alcohols, Substrate utilization, *Aliphatic hydrocarbons.

An analytical method is described of calculating the balance of carbon, hydrogen, oxygen and nitrogen when cultivating microorganisms on n-alkanes and n-alcohols with ammonia as nitrogen source. Equations show the relationship between oxygen uptake per g of synthesized biomass and economic coefficient with respect to carbon. This relationship has been investigated. (Long-Battelle)
W73-05260

VIBRIO PSYCHROERYTHRUS SP. N.: CLASSIFICATION OF THE PSYCHROPHILIC MARINE BACTERIUM, NRC 1004,
Ottawa Univ. (Ontario). Dept. of Biology.
J. Y. D'Aoust, and D. J. Kushner.
Journal of Bacteriology, Vol 111, No 2, p 340-342, August, 1972. 2 tab, 23 ref.

Descriptors: *Systematics, *Marine bacteria, *Cultures, Pollutant identification, Spectrophotometry, Physical properties, Thermal properties, Enzymes.
Identifiers: *Biochemical tests, *Psychrophilic bacteria, *Vibrio psychroerythrus, Culture media, Guanine, Cytosine, Thermal denaturation, Vibrostat, Catalase, Oxidase, Bacillus subtilis, Deoxyribonucleic acid.

A red-pigmented organism, formerly known as marine psychrophile NRC 1004, has been classified as Vibrio psychroerythrus sp. n. Classification was mainly based on morphology, the ability of the organism to oxidize and ferment glucose, its sensitivity to vibriostat 0/129, and its dexyribonucleic acid base composition of 40.0 moles percent guanine plus cytosine, determined by thermal denaturation. The organism gave positive reactions for catalase, oxidase, and starch hydrolysis and produced acid from maltose and dextrin but not from arabinose. It is idole- and citrate-negative and reduced nitrate to nitrite without producing gas. (Long-Battelle)
W73-05261

ECOLOGY OF SULFUR-OXIDIZING BACTERIA IN HOT ACID SOILS,
Indiana Univ., Bloomington. Dept. of Microbiology.
For primary bibliographic entry see Field 05B.
W73-05262

ESCHERICHIA COLI O ANTIGEN TYPING BY MEANS OF A MECHANIZED MICROTECHNIQUE,
Rijksinstituut voor de Volksgezondheid, Bilthoven (Netherlands). Lab. of Bacteriology.
P. A. M. Guinee, C. M. Agterberg, and W. H. Jansen.
Applied Microbiology, Vol 24, No 1, p 127-131, July 1972. 3 fig, 1 tab, 6 ref.

Descriptors: *E. coli, *Cultures, *Laboratory equipment, *Volumetric analysis, *Automation, Pollutant identification, Mechanical equipment, Automatic control, Isolation, Separation techniques.
Identifiers: *Serotyping, Culture media, Differential media.

The method for O antigen typing of E. coli involves the use of clear plastic trays with 8 by 15 U-formed cups for culturing the organisms. A multiple dropper containing 120 syringes mounted to match the cups in the trays is then used to add antisera to each culture. An adjustable stepper motor is used to dispense equal dosages from each syringe. The procedure developed is as follows: First day, inoculate strain in 10 ml of broth and incubate overnight. Second day, heat broth culture to 100 C for 2 hours, cool, add formalinized saline containing Gentian violet, incubate overnight. Third day, read agglutinations in a reading box, titrate positive reactions with an Autotiter II, add antigen. If reactions are negative, inoculate in 10 ml and incubate overnight. Fourth day, read titrations, autoclave, cool, strain the antigen, and test against 1:10 dilutions of O antisera 08, 09, 0101. Fifth day, read agglutinations and if positive, titrate. Sixth day, read titrations. This procedure produced results comparable to those obtained with conventional techniques. Titrations in trays yielded slightly lower titers than did those in glass tubes. This problem is not considered to be serious. The method requires smaller amounts of antisera and antigens, less space, and less time. (Little-Battelle)
W73-05263

EFFECT OF EVAPORATION LOSSES ON EXPERIMENTAL CONTINUOUS CULTURE RESULTS,
University of Manchester Inst. of Science and Technology (England). Dept. of Chemical Engineering.
For primary bibliographic entry see Field 05B.
W73-05266

CHEMOTAXONOMIC CHARACTERS AND CLASSIFICATION OF SOME NOCARDIOFORM BACTERIA,
Polish Academy of Sciences, Wroclaw. Inst. of Immunology and Experimental Therapy.
H. Mordarska, and M. Mordarski.
Journal of General Microbiology, Vol 71, No 1, p 77-86, June, 1972. 1 fig, 2 tab, 24 ref.

Descriptors: *Lipids, *Pollutant identification, *Systematices, Chemical analysis, Chromatography, Acids, Bioindicators, Cultures, Separation techniques, Organic compounds.
Identifiers: *Nocardioform bacteria, *Chemotaxonomy, *Biochemical characteristics, Thin layer chromatography, Paper chromatography, Arabinose, meso-diaminopimelic acid, Nocardia asteroides, Streptomyces griseus, Nocardia caviae, Nocardia coagolensis, Nocardia convoluta, Nocardia cuniuli, Nocardia farcinica, Nocardia gardneri, Culture media, Nocardia calcarea, Nocardia brasiliensis.

In seeking chemical methods of classifying nocardioform bacteria, simple chemical analyses were carried out on 198 strains using paper and thin-layer chromatography. Cultures were grown in shake flasks at 37C for 3-5 days in glucose peptone

broth and in modified Santer's medium. Thin-layer chromatograms for lipid analysis were developed in a petroleum ether-diethyl ether-glacial acetic acid system, dried, and exposed to iodine vapor. Lipid spots appeared after about 5 min. Paper chromatography was used to identify arabinose and diaminopimelic acid. The strains considered to belong to the genus Nocardia contained the lipid LCN-A, arabinose and meso-diaminopimelic acid. All the respresentative strains from the 'Mycobacterium' rhodochrous complex possessed this lipid though in certain cases the characteristic spot had a slightly lower R sub f value than that of the reference lipid LCN-A from the standard strain of Nocardia asteroides. The general Actinomadu, Mycobacterium, Oerskovia and Streptomyces did not contain lipid LCN-A and the distribution of the other two chemical characters varied. The method used to detect lipid LCN-A is simple and reliable and permits the separation of nocardias and 'M'. rhodochrows strains from allied taxa. These results correlate well with other trends in the taxonomy of nocardioform bacteria and confirm the value of chemotaxonomic characters, especially lipids, in the classification and identification of these organisms. (Mortland-Battelle)
W73-05267

PRODUCTION OF AN AUTOINHIBITOR BY A THERMOPHILIC BACILLUS,
Massachusetts Inst. of Tech., Cambridge. Dept. of Nutrition and Food Science.
T. W. Chou, R. Greasham, S. R. Tannenbaum, and A. L. Demain.
Journal of Bacteriology, Vol 111, No 2, p 459-464, August, 1972. 6 fig, 1 tab, 7 ref.

Descriptors: *Thermophilic bacteria, *Pollutant identification, *Growth rates, Cultures, Microbiology, Colorimetry, Chemical analysis.
Identifiers: *Bacillus, *Autoinhibitors, Culture media, Sample preparation.

Premature cessation of rapid, exponential growth and a low final cell yield were observed with a thermophilic bacillus in a glucose-mineral salts-vitamin medium. Restricted growth was not due to nutrient or oxygen limitation, to depressed pH, or to the physical effect of 'crowding'. Glucose conversion to cellular material was efficient at a low glucose charge (0.1 percent), but decreased with increasing concentrations of glucose. The likelihood that an autoinhibitor (s) was being produced was considered. Further studies revealed that an autoinhibitor appeared in the culture supernatant fluid at the end of the exponential phase. The factor was soluble in 75 percent ethanol which precipitated a large amount of extracellular slime. The crude inhibitor in the alcohol filtrate was dialyzable and withstood 3 hours of incubation at pH 2 or 12, and 30 min of boiling. (Long-Battelle)
W73-05270

EFFECT OF CYCLOPENTANEGLYCINE ON METABOLISM IN SALMONELLA TYPHIMURIUM,
New York State Univ., Stony Brook. Dept. of Biochemistry.
For primary bibliographic entry see Field 05C.
W73-05273

ROLE OF IRON AND SULFUR IN PIGMENT AND SLIME FORMATION BY PSEUDOMONAS AERUGINOSA,
Eastern Regional Research Lab., Philadelphia, Pa.
For primary bibliographic entry see Field 05B.
W73-05274

SCANNING ELECTRON MICROSCOPY OF L--PHASE STREPTOCOCCI. II. GROWTH IN BROTH AND UPON MILLIPORE FILTERS,
California Univ., Berkeley. School of Public Health.
D. J. Bibel, and J. W. Lawson.
Canadian Journal of Microbiology, Vol 18, No 8, p 1179-1184, August, 1972. 12 fig, 1 tab, 15 ref.

Descriptors: *Streptococcus, *Growth rates, Electron microscopy, Bioindicators, Cultures, Membrane processes, Separation techniques.
Identifiers: *Scanning electron microscopy, *Culture media, Millipore filters, Osmotic sensitivity, Agars, Trypticase Soy Broth, Brucella Broth, Culturing techniques, Light microscopy, Sample preparation, Membrane filters.

Scanning electron microscopy was used to study morphologic changes in broth cultures of the L-phase of streptococci. The colonies of representative strains grown on Millipore membrane filters were also compared. Brucella Broth and 2 percent ammonium chloride were used to maintain the F24-L and Z30-L strains, and Trypticase Soy Broth and 3 percent NaCl were used for strain ADA-L, AED-L, and GL8-L. A comparison was also made of growth on agar. Broth culture samples were centrifuged, washed, rinsed, mounted, and incubated for 3 days at 37C. Colonies were then dried to the critical point and coated with gold-palladium alloy for scanning electron microscopic investigations. To follow growth, microscopic observations in broth were conducted at various times during culturing. Osmotic sensitivity, shape, size, and surface features of L-phase bodies, ratios of large bodies to granules, and number of units in clusters varied with the phase of growth in broth. During the lag phase of growth the L-phase elements seemed to posses a weakened membrane as suggested by their increased susceptibility to osmotic lysis and their flattened shape. Irregular protuberances, which may be associated with formation of elementary corpuscles or degeneration of membrane, were found on large bodies in stationary phase. Replication in broth appeared to occur by single budding of large bodies or binary fission of granules. (Mortland-Battelle)
W73-05275

ISOLATION AND CHARACTERIZATION OF N--BUTANE-UTILIZING MICROORGANISMS,
Toronto Univ. (Ontario). Dept. of Chemical Engineering and Applied Chemistry.
A. G. McLee, A. C. Kormendy, and M. Wayman.
Canadian Journal of Microbioloby, Vol 18, No 8, p 1191-1195, August, 1972. 6 tab, 20 ref.

Descriptors: *Isolation, *Cultures, *Respiration, *Microorganisms, Fungi, Pollutant identification, Organic compounds, Essential nutrients, Nutrient requirements, Systematics, Gas chromatography, Growth rates, Gases, Methane, Monitoring, Manometers, Instrumentation, Oxygen, Nitrogen, Inhibition, Biodegradation.
Identifiers: *N-butane, *Substrate utilization, *Characterization, Culture media, Arthrobacter, Brevibacterium, Penicillium nigricans, Allescheria boydii, Graphium cumeiferum, Gliocladium, Alkanes, N-butanol, Glucose, Propane, Ethane, Isobutane, N-hexadecane, Nephelometer.

Fifteen bacterial strains and four molds capable of growth on n-butane were isolated and partially classified. The bacteria were mostly Arthrobacter sp. and Brevibacterium sp.; among the molds Penicillium nigricans, Allescheria boydii, and Graphium cumeiferum were identified, while the remaining mold had the appearance of Gliocladium, but was not firmly identified. Although able to grow on other alkanes and orthodox media, the bacterial isolates could not use methane. Growth rates on n-butane were unaffected by varying air or substrate partial pressures in the range of 10-90 percent atmosphere. High partial pressure of oxygen was inhibitory to most bacterial isolates, the degree of inhibition varying widely, however. Growth rates on n-butanol and on glucose were signigicantly higher than those on n-butane. Among the molds, only the Graphium would grow well in a submerged, shaking culture. (Long-Battelle)
W73-05276

ENRICHMENT AND SELECTIVE ISOLATION OF CARYOPHANON LATUM,
Mount Allison Univ., Sackville, (New Brunswick). Dept. of Biology.
D. L. Smith, and W. C. Trentini.
Canadian Journal of Microbiology, Vol 18, No 8, p 1197-1200, August, 1972. 2 fig, 1 tab, 5 ref.

Descriptors: *Isolation, *Pollutant identification, Nutrients, Antibiotics (Pesticides), Centrifugation, Filtration, Resistance, Farm wastes, Biodegradation, Water pollution sources, Aerobic bacteria, Microscopy, Feces, Cultures, Cattle.
Identifiers: *Caryophanon latum, *Selective media, *Enrichment, Sensitivity, Culture media, Sample preparation.

Nineteen isolates of Caryophanon latum were tested for sensitivity to several antibiotics. All isolates were found to be resistant to high concentrations of streptomycin sulfate while maintaining natural trichome morphology. Based on this finding an isolation procedure using differential low-speed centrifugation, filtration, and streptomycin resistance was devised which resulted in the selective isolation of C. latum from cow dung enrichments. This procedure results in C. latum accounting for about 70 percent of the colonies found after dilution and spreading onto cow dung - streptomycin agar. (Byrd-Battelle)
W73-05277

DIFFERENTIATION OF ASPERGILLUS SOJAE FROM ASPERGILLUS ORYZAE BY POLYACRYLAMIDE GEL DISC ELECTROPHORESIS,
Noda Inst. for Scientific Research, (Japan).
S. Nasuno.
Journal of General Microbiology, Vol 71, No 1, p 29-33, June 1972. 1 fig, 2 tab, 12 ref.

Descriptors: *Enzymes, *Separation techniques, *Pollutant identification, Assay, Electron microscopy, Aquatic fungi, Biological properties, Chemical analysis, Cultures, Systema.
Identifiers: *Aspergillus sojae, *Aspergillus oryzae, *Disc electrophoresis, *Characterization, *Alkaline proteinases, *Polyacrylamide gel, Enzyme preparation, Conidia, Biochemical characteristics, Aspergillus parasiticus, Aspergillus flavus.

Polyacrylamide gel disc electrophoresis has been used to characterize alkaline proteinases from Aspergillus oryzae and A. sojae. The fungus was usually grown at 30C for 72 hours in stationary flasks on a solid medium or in shaken flasks on a liquid medium. The enzymes were precipitated from cooled distilled water culture extracts or culture filtrates by addition of two volumes of ethanol at minus 20 degrees, dissolved in a small volume of distilled water and used for gel electrophoresis after removal of insoluble substances by centrifugation at 4000 g for 5 min. In general, the procedure described by Davis (1964) was followed for disc electrophoresis on polyacrylamide gels. Samples were applied in 20 percent (w/v) sucrose solution and spacer gels were omitted. After a run at 4 mA per gel column at 4C for an appropriate period, frozen gels were sliced laterally into 2 mm strips, extracted for 4 hours to overnight 4C with 2 ml of 0.05 M-phosphate buffer at pH 7.3 and assayed for alkaline proteinase. Comparisons were limited to tubes run simultaneously. Alkaline proteinase activity was determined by the modified Anson's method. To obtain mature conidia for electron microscopy the fungi were grown on Czapek's slopes at 30C for 21 days. Electron micrographs of dry conidia on collodion-coated grids were taken with a Hitachi HS-6 type electron microscope. Alkaline proteinases from strains of Aspergillus oryzae and A. sojae migrated with species-specific mobility in electrophoresis on polyacrylamide gels; the protein

patterns were not affected by age or cultural conditions. The results support the establishment of A. sojae as a species distinct from A. oryzae. (Long-Battelle)
W73-05278

ELECTRON MICROSCOPICAL CHARACTERIZATION OF NEWLY ISOLATED RHIZOBIUM LUPINI BACTERIOPHAGES,
Erlangen-Nuremberg Univ. (West Germany).
W. Lotz, and F. Mayer.
Canadian Journal of Microbiology, Vol 18, No 8, p 1271-1274, August, 1972. 8 fig, 1 tab, 17 ref.

Descriptors: *Electron microscopy, *Bacteriophage, *Pollutant identification, *Isolation, Centrifugation, Filtration, Water pollution sources, Hosts, Systematics, Soil bacteria, Methodology.
Identifiers: *Rhizobium lupini, Compost soil, Sample preparation, Plaque counts.

Eight newly isolated Rhizobium lupini bacteriophages from compost soil were investigated with the electron microscope. Rhizobium lupini strains from three different sources were used as host bacteria for the isolated bacteriophages: 1-99, 16-3, 16-6, 16-7, 16-22, 16-35, and 16-3. Phage isolation was accomplished by centrifuging suspended compost soil, filtering, spotting on a lawn of indicator bacteria, and purifying via several single-plaque passages. Characterization of the phages was carried out by standard electron microscopic procedures. The phage particles investigated had either long contractile, long noncontractile, or short non-contractile tails. The wedge-shaped appearance of short phage tails is discussed. (Byrd-Battelle)
W73-05279

A PH-DEPENDENT SUCCESSION OF IRON BACTERIA,
Harvard Univ. Cambridge, Mass. Lab. of Applied Microbiology.
R. Mitchell.
Environmental Science and Technology, Vol 6, No 8, p 809-812, September, 1972. 1 fig, 5 tab, 14 ref.

Descriptors: *Iron bacteria, *Iron, *Oxidation, *Thiobacillus ferrooxidans, *Pollutant identification, Sediments, Isolation, Mine drainage, Chemical reactions, Productivity, Acid mine water, Sampling, Coal mines, Culture, Aerobic bacteria, Streams.
Identifiers: Filamentous bacteria, Zinc mines, Metallogenium, Culture media, Heterotrophic bacteria, Sample preparation.

A filamentous iron bacterium, Thiobacillus ferrooxidans, was examined for its role in affecting the pH-dependent oxidation of iron. The organism, selectively isolated from samples obtained from a wide variety of sources including coal mines, iron-containing streams, and zinc mines, was cultured at different pH ranges (3.5 to 5.5) in order to determine the rate of ferrous iron oxidation at the various pH's. The organism catalyzes iron oxidation in the pH range 4.5 to 3.5. At pH greater than 4.5, abiotic iron oxidation proceeds rapidly. At pH less than 3.5, T. ferrooxidans significantly catalyzes iron oxidation. The activity of these bacteria in the degradation of iron may directly affect the rate of acidity production in coal mine waters. (Long-Battelle)
W73-05280

SIMPLIFIED STORAGE AND RETRIEVAL OF STOCK CULTURES,
Harvard Medical School, Boston, Mass. Dept. of Microbiology and Molecular Genetics.
J. G. Nagel, and L. J. Kunz.
Applied Microbiology, Vol 23, No 4, p 837-838, April 1972.

Descriptors: *Bacteria, *Cultures, *Yeasts, *Storage, E. coli, Salmonella, Pseudomonas, Shigella, Clostridium, Streptococcus.
Identifiers: *Sample preservation, *Glass beads, Enterococcus.

Multiple replicate units of stock cultures of certain bacteria and yeasts can be prepared, stored, and retrieved for use by a method that eliminates the need for multiple containers. The method involves the coating of sterile glass beads with a mixture of equal parts of broth culture and horse blood and storing the coated beads in a single labeled, plastic tube in a mechanical freezer. The cultures maintained by this method were satisfactorily stored for periods of more than one month for Clostridium sporogenes to more than 10 months for Escherichia coli. (Snyder-Battelle)
W73-05281

INFRARED ESTIMATION OF OIL CONTENT IN SEDIMENTS IN PRESENCE OF BIOLOGICAL MATTER,
Cincinnati Univ., Ohio. Dept. of Chemistry.
H. B. Mark, Jr., T-C. Yu, J. S. Mattson, and R. L. Kolpack.
Environmental Science and Technology, Vol 6, No 9, p 833-834, September 1972. 1 fig, 2 tab, 7 ref.

Descriptors: *Oil, *Pollutant identification, *Sediments, *Organic matter, Oil pollution, Oil spills, Plankton, Algae, Shrimp, Kelps.
Identifiers: *Infrared spectrophotometry, *Chemical interference, Crude oil, Infrared spectra, Absorbance, Seaweed, Santa Barbara Channel, Biological samples.

The presence of organic debris in sediment interferes with IR detection of oil by the -CH2- groups since absorbance at 2925/cm is the same for oil and biological matter containing these groups. Examination of IR spectra of a large number of crude oils and biological materials showed that the latter have a characteristic absorbance at 1650/cm (the -NH-band). By measuring absorbance at both frequencies it was possible to apply connection factors to permit calculation of oil content. To test the method, several sediment samples from the Santa Barbara Channel were analyzed. The results proved to be satisfactory. One limitation of the method is that results will be erroneous if organic matter is present which does not contain the -NH- group. Consequently, it is recommended that the total IR spectra be examined for other interfering groups. (Long-Battelle)
W73-05282

TRIALS WITH AN AUTOMATED PLANKTON COUNTER,
Fisheries Research Board of Canada, Nanaimo (British Columbia). Biological Station.
For primary bibliographic entry see Field 07B.
W73-05283

WATER-CHEMICAL INVESTIGATIONS IN THE CSONGRADSZEGED REACHES OF THE TISZA,
J. Szepfalusi.
Tiscia. 6: p 3-18. 1970/1971. Illus.
Identifiers: Chemical composition, Csongrad, *Hungary, Pollutants, Szeged, Tisza, Water pollution, Pollutant identification.

A short characterization of the chemical composition of the water, the major pollutants and the characteristic changes in water quality, over the past 10 yr is presented.--Copyright 1972, Biological Abstracts, Inc.
W73-05284

MACHINE FOR AUTOMATIC BACTERIOLOGICAL POUR PLATE PREPARATION,
Unilever Ltd., Sharnbrook (England). Unilever Research Lab.
For primary bibliographic entry see Field 07B.
W73-05286

CATALASE TEST AS AN AID TO THE IDENTIFICATION OF ENTEROBACTERIACEAE,
Grant Hospital of Chicago, Ill.
W. I. Taylor, and D. Achanzar.
Applied Microbiology, Vol 24, No 1, p 58-61, July 1972. 2 tab, 10 ref.

Descriptors: *Pollutant identification, *Cultures, *Enteric bacteria, Salmonella, Shigella, Coliforms, Pathogenic bacteria.
Identifiers: *Differential media, Serratia, Proteus, Providencia, Escherichia, Enterobacter, Klebsiella, Culture media.

Under the conditions of the clinical laboratory, a simple, rapid, and accurate method for the catalase test was developed that has been of great value as an aid in the identification of the Enterobacteriaceae. With 3 percent hydrogen peroxide, Serratia, Proteus, and Providencia were vigorous catalase reactors. Only Salmonella and rare Escherichia, Enterobacter, and Klebsiella isolates were moderate catalase reactors. Escherichia and Shigella strains were mostly nonreactive, with less than one-third weakly (plus) reactive, whereas most Enterobacter strains tended to be weakly reactive. Klebsiella strains were divided equally between nonreactive and weakly reactive. In practice, this test was also of great value in discerning nonpigmented Serratia cultured from the hospital environment and in detecting mixed flora containing nonspreading Proteus. (Little-Battelle)
W73-05287

ELIMINATION OF MYCOPLASMA CONTAMINANTS FROM VIRUS STOCKS BY TREATMENT WITH NONIONIC DETERGENTS,
Maryland Univ., College Park. Dept. of Microbiology.
R. G. Wolford, and F. M. Hetrick.
Applied Microbiology, Vol 24, No 1, p 18-21, July 1972. 4 tab, 8 ref.

Descriptors: *Viruses, *Treatment, *Toxicity, *Cultures, Microorganisms, Feasibility studies, Bioassay, Pathogenic bacteria, Aerobic bacteria, Isolation.
Identifiers: *Mycoplasma, *Nonionic detergents, *Decontamination, Sample preparation, Mycoplasma hominis, Mycoplasma hyorhinis, Acholeplasma laidlawii, Tween 20, Tween 40, Tween 60, Tween 80, Trition WR-1339, Herpes simplex virus, Vesicular stomatitis virus, California encephalitis virus, Newcastle disease virus, Culturing techniques, Mycoplasma orale, Vaccina virus, Poliomyelitis virus type 1.

Five nonionic detergents (Tweens 20, 40, 60 and 80 and Triton WR-1339) were tested for their ability to inactivate four Mycoplasma species which are common contaminants of tissue cultures. To determine the effectiveness of the detergents, Mycoplasma species, numerous viruses (vaccina, vesicular stomatis virus, Newcastle disease virus, California encephalitis virus, poliomeylitis virus type 1, or herpes simplex) and Mycoplasma-contaminated viral cultures were exposed to the detergents. Tween 20 was the most effective, in that 2.5 mg/ml completely inactivated cultures of M. hominis, M. hyorhinis, and Acholesplasma laidlawii within 1 hr and M. orale within 3 hours. The other detergents exhibited various degrees of activity against the mycoplasmas, with Triton WR-1339 being the least effective. All 4 Tween compounds were highly virucidal for herpes simplex virus. Tween 20 also was virucidal against vesicular stomatitis virus, California encephalitis virus, and Newcastle disease virus and Tween 80 was active against California encephalitis and Newcastle disease viruses. Detergent treatment procedures were effective in two instances in eliminating mycoplasma contaminants from virus preparations while retaining most of the viral infectivity. (Long-Battelle)

W73-05288

CONCENTRATION AND PURIFICATION OF POLIOVIRUS BY ULTRAFILTRATION AND ISOPYCNIC CENTRIFUGATION,
Ohio State Univ., Columbus. Dept. of Microbiology.
L. E. Guskey, and D. A. Wolff.
Applied Microbiology, Vol 24, No 1, p 13-17, July 1972. 4 fig, 1 tab, 13 ref.

Descriptors: *Isolation, Laboratory equipment, Separation techniques, Membrane processes, Filtration, Dialysis, Spectrophotometry, Methodology.
Identifiers: *Poliovirus, *Isopycnic centrifugation, *Concentration, *Ultrafiltration, CsCl cushion centrifugation, Ultrafilter concentration, Membrane filters, Uridine-5-H-3, Uridine-H-3, Scintillation counting, Liquid scintillation, Recovery, Sample preparation, Ultraviolet spectra.

A CsCl-gradient centrifugation and an ultrafiltration technique, utilizing a Diaflo XM-50 ultrafilter membrane, were compared for the concentration and purification of large quantities of poliovirus. Sample preparation for both techniques involved centrifuging infected cells, freeze-thawing 3 times, recentrifuging, and extracting with fluorocarbon Freon to remove nonviral proteins and cellular debris. Total recovered virus from the freon-extracted sample was somewhat greater using Diaflo membrane filtration rather than the CsCl cushion centrifugation. During concentration of the virus, improved efficiency could be obtained by eliminating extraneous contaminating proteins by trypsin digestion. Further purification and concentration of the ultrafiltered poliovirus preparations by isopynic centrifugation showed a 1,724-fold volumetric concentration of virus. The advantages of using the combined ultrafiltration and isopycnic centrifugation procedures include an economy of time and effort with the production of a concentrated, relatively pure virus preparation. (Long-Battelle)
W73-05289

TECHNIQUE AND APPARATUS FOR RAPID AND INEXPENSIVE ENUMERATION OF BACTERIA,
Unilever Ltd., Sharnbrook (England). Unilever Research Lab.
For primary bibliographic entry see Field 07B.
W73-05290

PRACTICAL TRAY-RACK FOR CULTURE DISH INCUBATION,
Mayo Clinic, Rochester, Minn.; and Mayo Foundation, Rochester, Minn.
For primary bibliographic entry see Field 07B.
W73-05291

PRODUCTION OF TYPES A AND B SPORES OF CLOSTRIDIUM BOTULINUM BY THE BIPHASIC METHOD: EFFECT ON SPORE POPULATION, RADIATION RESISTANCE, AND TOXIGENICITY,
Army Natick Labs., Mass. Food Lab.
A. Anellis, D. Berkowitz, D. Kemper, and D. B. Rowley.
Applied Microbiology, Vol 23, No 4, p 734-739, April 1972. 6 tab, 7 ref.

Descriptors: *Clostridium, *Cultures, *Spores, *Toxicity, *Radiation, Incubation, Microscopy, Centrifugation, Irradiation, Volumetric analysis.
Identifiers: Clostridium botulinum, Inoculation, Agars, Radiation resistance, Sporogeneis, Biphasic method, Thiamine hydrochloride, Yeast extract, Culture media, Co-60, Culturing techniques.

A biphasic system is a more rapid, convenient, and economical means of obtaining Clostridium botulinum spores than the conventional deep broth culture methods. There was no essential difference in the radiation resistance on the toxin-forming capability of the spores produced by the two techniques. Three representative strains of C. botulinum were propagated in a broth of 5 percent BBL trypticase, 0.5 percent peptone, and 0.125 percent K2HPO4. Filter sterilized NaHCO3 was added prior to inoculation. After inoculation and incubation at 30 C for up to 12 days, sporulation was accomplished in an agar of practically the same composition. For spore counting, samples taken periodically were heat shocked, decimally diluted, inoculated into triplicate tubes, mixed, stratified after solidification, and incubated for 36 to 48 hours at 30 C. The macrocolonies in the triplicate tubes were then averaged. Dry smears of cultures were then stained with aqueous methylene blue and the percentage of germinated spores was estimated microscopically. For measurement of radiation resistance, spores were irradiated with Co-60 gamma rays. Samples were also observed for 4 days for typical botulinal death and toxicity values were calculated. (Mortland-Battelle)
W73-05292

A RAPID METHOD FOR THE DETERMINATION OF RADIOACTIVE CESIUM ISOTOPES IN WATER,
Geological Survey, Lakewood, Colo.
V. J. Janzer.
Journal of Research, U. S. Geological Survey, Vol 1, No 1, p 113-115, January - February 1973. 1 tab, 8 ref.

Descriptors: *Cesium, *Radioisotopes, *Fallout, *Pollutant identification, *Water analysis, Water chemistry, Chemical analysis, Radiochemical analysis.
Identifiers: *Cesium radioisotopes.

Radioactive cesium in water is concentrated by ion-exchange on finely divided ammonium hexacyanocobalt ferrate and then determined by beta counting. No carrier is added, and the method can be used to determine beta-emitting cesium isotopes at the 10-pCi/liter level using a 100-ml sample. Five samples can be prepared for counting in approximately 3 hours, and the method is applicable to fresh and saline waters. (Knapp-USGS)
W73-05300

INDEX OF WATER-QUALITY STATIONS, WATER YEAR 1972.
Geological Survey, Washington, D.C. Water Resources Div.
For primary bibliographic entry see Field 07C.
W73-05336

RECENT SEDIMENTARY HISTORY OF LAKE MENDOTA, WIS.,
Wisconsin Univ., Madison. Water Chemistry Program.
G. C. Bortleson, and G. F. Lee.
Environmental Science and Technology, Vol 6, No 9, p 799-808, September 1972. 3 fig, 5 tab, 55 ref. OWRR A-001-WIS (3).

Descriptors: *Lake sediments, *History, Sampling, Core drilling, Sediment yield, Eutrophication, Alkaline earth metals, Alkali metals, Sedimentology, Chemical analysis, Heavy metals, Carbon dioxide, Thermal conductivity, Pollutant identification, Algae, Nutrients, Iron, Phosphorus, Magnesium, Potassium, Calcium, Aluminum, Colorimetry, Nitrogen, Carbon, Pollen.
Identifiers: *Lake Mendota, Orthophenanthroline procedure, Atomic absorption spectrophotometry, Kjeldahl procedure, Combustion, Ambrosia pollen analysis, Kjeldahl nitrogen, Vanadomolybdophosphoric yellow colorimetry, Sediment cores, Black gyttja.

The chemical composition of several sediment cores taken from Lake Mendota, Madison, Wis., has been investigated to determine changes in the flux of various chemicals to this lake. Representative sediment core samples were collected and total phosphorus, iron, magnesium, potassium, calcium, and aluminum determined by orthophenanthroline, colorimetric and atomic absorption spectrophotometric procedures. Also, organic nitrogen was determined by semimicro Kjeldahl technique, total carbon by a dry combustion technique, CO2 by a thermal conductivity cell and pollen assemblage by Ambrosia pollen analysis. The uppermost sediments consisted of approximately 1/2 meter of black gyttja. The chemical stratigraphy of a 9.9 meter-long core indicates that stable conditions existed in Lake Mendota and its watershed prior to the settlement of the area surrounding the lake by the white man in the mid to late 1800s. Since that time, there has been an appreciable increase in the amounts of phosphorus, iron, manganese, aluminum, and potassium in the uppermost sediments. The organic carbon content of the sediments has fluctuated several times in the past with the most recent sediments showing slightly higher values than the older sediments. This study has demonstrated the feasibility of using the chemical composition of lake cores to estimate the influence of cultural activities of man on the rate of eutrophication of a lake. (See also W72-07952) (Byrd-Battelle)
W73-05339

BIOCHEMICAL STUDIES ON MINAMATA DISEASE IV. ISOLATION AND CHEMICAL IDENTIFICATION OF THE MERCURY COMPOUND IN THE TOXIC SHELLFISH WITH SPECIAL REFERENCE TO THE CAUSAL AGENT OF THE DISEASE,
Kumamoto Univ. (Japan). Medical School.
For primary bibliographic entry see Field 05C.
W73-05391

IS MERCURY FROM HAWAIIAN VOLCANOES A NATURAL SOURCE OF POLLUTION,
Hawaii Univ., Honolulu.
For primary bibliographic entry see Field 05B.
W73-05396

ESTIMATION OF MIXED PHENYL AND ETHYL MERCURIC COMPOUNDS,
Western Washington Research and Extension Center, Puyallup.
D. Polley, and V. L. Miller.
Analytical Chemistry, Vol 24, No 10, p 1622-1623, October 1952. 5 tab, 5 ref.

Descriptors: *Fungicides, *Mercury, *Analytical techniques, Laboratory tests, Sampling, Testing, Heavy metals, Trace elements, Metals, Pollutant identification, Organic compounds.
Identifiers: *Organomercury compounds, Phenyl mercury, Ethyl mercury.

In an investigation of fungicides it became desirable to find a method of determining ethyl mercuric and phenyl mercuric compounds in formulations which contained one or both materials. The reaction of diphenylthiocarbazone (dithizone) with several organic mercurials and two analytical procedures using this reaction have been reported previously. Because the phenyl and ethyl derivatives form the dithizonates under like conditions, a modification is necessary to determine one in the presence of the other. With the method reported a solution containing both the ethyl and the phenyl compounds may be analyzed for each component. The procedure is based on the rapid decomposition of phenyl mercuric compounds to inorganic mercury and the relative stability of ethyl mercuric compounds in hydrochloric acid. The overall accu-

racy of the procedure for each component is 3% of the sum of the two parts unless this percentage is less than 2 micrograms. (Oleszkiewicz-Vanderbilt)
W73-05397

POTENTIOMETRIC TITRATION OF MERCURY USING THE IODIDE-SELECTIVE ELECTRODE AS INDICATOR,
Du Pont de Nemours (E. I.) and Co., Aiken, S.C. Savannah River Lab.
R. F. Overman.
Analytical Chemistry, Vol 43, No 4, p 616-617, April 1971. 2 fig, 1 tab, 5 ref. AEC-AT (07-2)-1.

Descriptors: *Mercury, *Analytical techniques, *Ions, *Electrodes, *Iodides, Water pollution, Volumetric analysis, Pollutant identification.
Identifiers: Interferences, *Ion-selective electrodes.

A method for the measurement of mercury in radioactive process solutions is described. It involves the titration of mercuric ion against iodide with the iodide-selective electrode as an indicator. The titration was not affected by adding a solution of salts. The titration of Hg (2+) with I (-) follows the stoichiometry I:2 down to Hg (2+) concentrations of about 0.000005 M, and useful results can be obtained down to about 0.000001 M by calibrating with standard samples. This lower limit corresponds to about 10 microgram of mercury in the titration vessel. Complexing agents, if present, can be effectively removed from the reaction by adding a metal with a higher complexing constant than Hg (2+), such as Fe (3+). The Hg (2+), displaced from the metal complex, can then be titrated. Oxidizing and reducing agents should be absent or decomposed before the titration because any change in the oxidation state of either I (-) or Hg (2+) must be avoided. Some redox reactions require an initiation time for the reaction to start, and it is possible to perform the titration before the redox reaction starts. (Eagle-Vanderbilt)
W73-05401

THE INVESTIGATION OF THE GEOGRAPHICAL AND VERTICAL DISTRIBUTION OF SEVERAL TRACE ELEMENTS IN SEA WATER USING NEUTRON ACTIVATION ANALYSIS,
Yale Univ., New Haven, Conn. Dept. of Geology and Geophysics.
D. F. Schutz, and K. K. Turekian.
Geochimica et Cosmochimica Acta, Vol 29, p 259-313, 1965. 12 fig, 13 tab, 83 ref. AEC-AT (30-1) 2912.

Descriptors: *Trace elements, *Water analysis, *Neutron activation analysis, *Sea water, Spatial distribution, Geographical regions, Cobalt, Nickel, Weathering, Volcanoes, Runoff, Chemical precipitation, Mixing, Organic matter.
Identifiers: Silver.

Eighteen trace elements in sea water were measured by neutron activation analysis. Distributional variations for silver, cobalt and nickel make possible the evaluation of several factors which influence their concentrations in the ocean. The Atlantic Ocean north of 10 degrees S receives 60 percent of the total dissolved material supplied to the ocean by streams, but is lower in silver, cobalt and nickel than is the remainder of the world ocean, indicating that continental run-off is not important in the deep-sea economy of these elements. The evidence that nodule material in areas of the Central Pacific is of volcanic origin may also imply a volcanic origin for high concentrations of cobalt and nickel in the overlying water. Cobalt and nickel are relatively low in Long Island Sound compared to the North Atlantic, indicating nearshore removal of these elements from sea water. Increase in concentration of silver, cobalt and nickel with depth in areas of high organic productivity indicates alteration of trace element concentration by organic reactions. In areas where upwelling currents oppose the dowaward movement of organic material a relatively high steady state concentration may be produced. (Eagle-Vanderbilt)
W73-05403

A RAPID METHOD FOR THE DETERMINATION OF MERCURY IN URINE,
Arbetsmedicinska Institutet, Stockholm (Sweden). Dept. of Chemistry.
G. Lindstedt.
Analyst, Vol 95, p 264-271, March 1970. 4 fig, 1 tab, 19 ref.

Descriptors: *Mercury, *Analytical techniques, *Spectrophotometry, Colorimetry, Urine, Digestion, Laboratory tests, Reduction, Chemical reactions.
Identifiers: *Atomic absorption spectrophotometry, Interferences, Detection limit, Sensitivity.

A rapid and sensitive method for the determination of mercury in urine is described. It is based upon wet digestion of 1-ml samples of urine by potassium permanganate - sulphuric acid at room temperature overnight, reduction of mercury (II) to metallic mercury by tin (II), evaporation of mercury vapor from the solution by an air current at room temperature and determination of mercury by cold-vapor atomic-absorption measurement at 253-7 nm. Mercury determination on digested samples can be carried out at the speed of about 1 sample per minute. The amounts of chemicals and of glassware needed are much less than those required for the dithizone method. Detection limit is 2 ng of mercury in 1 ml of urine. The proposed method has been compared with dithizone analysis in a series of urine samples with fairly good results. Chemical interference from various substances is discussed. (Eagle-Vanderbilt)
W73-05404

ANALYSIS OF MERCURY BY FLAMELESS GAS,
Instrumentation Lab., Inc., Lexington, Mass.
J. Y. Hwang, and P. A. Ullucci.
American Laboratory, p 50-51, December 1970. 3 fig, 1 tab, 5 ref.

Descriptors: *Spectroscopy, *Mercury, *Analytical techniques, Reduction, Argon, Flow rate, Water analysis, Water pollution, Mixing, Toxicity.
Identifiers: *Atomic absorption spectroscopy.

Symptoms of mercury poisoning are described. To improve the sensitivity of mercury analysis compared to dithizone and conventional flame atomic absorption spectrometry methods, a cold vapor atomic absorption method was developed. With argon as the carrier gas, the sample is reduced with Na HCO3 and hydrazine hydrate and stirred and the elemental mercury is carried through the absorption cell. Studies were done to determine the optimum flow rate of the gas and mixing time of the sample with the reagents. A 0.2 microgram sample of mercury gives about 300 scale unit response with precision of plus or minus 6%. (Eagle-Vanderbilt)
W73-05407

AN EVALUATION OF METHODS FOR DETECTING MERCURY IN SOME U.S. COALS,
Bureau of Mines, Pittsburgh, Pa. Pittsburgh Energy Research Center.
M. D. Schlesinger, and H. Schultz.
Department of the Interior, Bureau of Mines Report of Investigations 7609, 1972. 11 p, 2 tab, 6 ref.

Descriptors: *Coals, *Mercury, *Analytical techniques, *Reviews, Laboratory tests, Electric powerplants, Air pollution, Spectroscopy, Neutron activation analysis.
Identifiers: Atomic absorption spectroscopy.

Mercury exists in coal in minute quantities, but the large tonnages of coal consumed could represent relatively large amounts of mercury entering the environment. Limits have now been placed on the emission of mercury, and it is important that reliable analytical methods be available to the chemist. Analytical techniques used by a number of laboratories were evaluated; most used vapor phase atomic absorption as the final detection method. Neutron activation was used by some of the laboratories. All of the methods described could be applied, but they require careful manipulation to prevent loss or mercury contamination. Techniques used with atomic absorption included combustion, combustion-acid absorption, acid digestion-reduction, wet ashing, combustion-silver amalgamation, digestion or combustion-amalgamation, and combustion-gold amalgamation. In the eleven samples analyzed the mercury content ranged between 0.05 plus or minus 0.01 and 0.41 plus or minus 0.06 part per million. (Eagle-Vanderbilt)
W73-05409

FIELD DETERMINATION OF NANOGRAM QUANTITIES OF MERCURY IN SOILS AND ROCKS,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 02K.
W73-05410

NON-FLAME METHODS FOR MERCURY DETERMINATION BY ATOMIC ABSORPTION--A REVIEW,
Perkin-Elmer Corp., Norwalk, Conn.
D. C. Manning.
Atomic Absorption Newsletter, Vol 9, No 5, p 97-99, September-October 1970. 43 ref.

Descriptors: *Mercury, *Analytical techniques, *Instrumentation, *Reviews, Digestion, Oxidation, Reduction (Chemical), Laboratory tests.
Identifiers: *Atomic absorption spectroscopy, Interferences.

A summary is presented of the published work on the determination of mercury at trace concentrations by non-flame atomic absorption spectroscopy. The methods used include the reduction of the mercury to elemental form and subsequent determination of the free mercury in an absorption cell; also the deposition of mercury onto a base metal from the sample solution, and subsequent thermal release of the mercury into an absorption cell. Schemes for compensating for interfering broadband absorption are described. Detection limits of less than 0.001 gm are possible using these methods. (Eagle-Vanderbilt)
W73-05413

STUDIES OF BENTHONIC FORAMINIFERA IN THE RESTIGOUCHE ESTUARY: 1. FAUNAL DISTRIBUTION PATTERNS NEAR POLLUTION SOURCES,
Bedford Inst., Dartmouth (Nova Scotia). Atlantic Oceanographic Lab.
For primary bibliographic entry see Field 05B.
W73-05419

ATOMIC ABSORPTION SPECTROMETRIC ANALYSES OF ACID-EXTRACTABLE MINOR ELEMENTS IN WASTES AND WASTE DEPOSITS,
State Univ. of New York, Stony Brook. Marine Sciences Research Center.
M. G. Gross, J. A. Black, and J. R. Schramel.
In: Survey of Marine Waste Deposits, New York Metropolitan Region Technical Report No 8, April, 1971. p 30-37, r 4 fig, 1 tab.

Descriptors: *Wastes, *Metals, *Sampling, Dispersion, Sludge, Pollutants, Lead, Tracers, Path of pollutants.
Identifiers: *Extraction techniques, *Atomic absorption spectrometry, *Marine waste deposits.

In order to provide more useful information about the behavior of wastes discharged into coastal waters, hydrochloric acid extracts were made of various wastes and waste deposits and their elemental composition (determined by atomic absorption spectrometry). Extractions of minor elements by hot hydrochloric acid proved difficult; this suggests that large amounts of such potentially dangerous elements will not leach out of the sludge deposits and enter seawater in a soluble form to be carried away and dispersed widely. Instead, most of the metals once incorporated into the sewage solids will remain there. The data provide the basis for more intensive investigations, such as using specific elements characteristic of certain types of wastes as tracers to study the distribution of these wastes. (Ensign-PAI)
W73-05431

ASPECT OF PETROLEUM POLLUTANT ANALYSIS,
British Petroleum Co. Ltd., London (England).
D. F. Duckworth.
In: Water Pollution by Oil Seminar, May 4-8, 1970, Aviemore, Inverness-shire, Scotland, The Institute of Petroleum, London. p 165-185. 1971. 8 fig, 6 tab, 2 append, 21 ref.

Descriptors: *Oil wastes, *Oil spills, *Weathering, *Beaches, *Chemical analysis, Water pollution sources, Sampling, Classification, Analytical techniques.
Identifiers: *Weathered oil, *Analytical identification schemes.

The problems involved in classifying oil which has been subject to weathering on beaches or in the sea and the inter-related problems of identifying the sources of these weathered oils are discussed. Research results indicate that various types of oil pollutants can be differentiated by an analysis of the sample itself. Positive identification involves a comparison of oil samples from all possible sources of the pollutant. Thus far, no single analytical technique has proven applicable to all types of weathered oil pollution. In coastal and estuarine areas, petroleum pollutants are chiefly weathered, emulsified residual type material. Positive source identification in the case of these kinds of pollutants can be obtained through the determination (on fractionated residues if possible) of their chromatogram, n-paraffin distribution, vanadium, nickel and sulfur contents. The data obtained can then be compared with samples for suspected pollutant sources. (Ensign-PAI)
W73-05457

MERCURY DISTRIBUTION LEVELS OBSERVED IN VARIOUS ECOSYSTEMS AS DETERMINED BY NEUTRON ACTIVATION ANALYSIS,
Interuniversitair Reactor Instituut, Delft (Netherlands).
For primary bibliographic entry see Field 05B.
W73-05482

POTOMAC RIVER SEDIMENT STUDY,
Naval Ordnance Station, Indian Head, Md.
For primary bibliographic entry see Field 05B.
W73-05483

A SCANNING TECHNIQUE FOR MULTI-ELEMENT ANALYSIS BY FLAME ATOMIC EMISSION SPECTROSCOPY,
Imperial Coll. of Science and Technology, London (England). Dept. of Chemistry.
D. O. Cooke, R. M. Dagnall, H. N. Johnson, G. F. Kirkbright, and T. S. West.
Laboratory Practice, Vol 21, No 3, p 171-173, March 1972. 3 fig, 3 tab, 11 ref.

Descriptors: *Aqueous solutions, *Milk, *Copper, *Magnesium, *Manganese, *Strontium, *Laboratory equipment, Spectrophotometry, Heavy metals, Calibrations.
Identifiers: *Atomic absorption spectrophotometry, *Detection limits, Atomic absorption, Multielement analysis, Recorders, Calibration curve, Sample preparation, Flame emission spectroscopy, Scanners.

Simple modifications to a commercially available atomic absorption spectrometer allow it to be adapted to the rapid sequential determination of several elements in the same solution by a scanning technique of flame atomic emission spectroscopy. Basically, the output from the photomultiplier is passed to a simple constructed operational amplifier and onto a UV recorder, both of which have the necessary rapid response characteristics. The wavelength scan is effected by means of a simple motor drive. The emissions of Cu, Mg, Mu, and Sr in aqueous solutions and milk are illustrated. (Little-Battelle)
W73-05497

BIOASSAY OF BIOTIN AND ITS DISTRIBUTION IN THE SEA,
Tokyo Univ. (Japan). Ocean Research Inst.
K. Ohwada.
Marine Biology, Vol 14, No 1, p 10-17, May 1972. 7 fig, 6 tab, 30 ref.

Descriptors: *Bioassay, *Sea water, *Bioindicators, *Distribution patterns, Vitamins, Cultures, Pacific Ocean, Spectrophotometry, Marine bacteria, Marine microorganisms, Sampling, Chlorophyll, Magnesium compounds, Euphotic zone, Pollutant identification.
Identifiers: *Biotin, *Achromabacter, East China Sea, Detection limits, Sagamic Bay, Suruga Bay, Vertical distribution, Sample preparation, Culture media, Chlorophyll a.

The marine bacterium, Achromabacter sp., was used as an indicator organism for the bioassay of biotin in various seawater samples. The organism showed a growth response in a synthetic seawater medium proportional to dissolved biotin in the range from 0.1 to 8.0 mg/l. The growth response was measured turbidimetrically with a spectrophotometer after incubation for 48 hr at 25 C with constant shaking. Water samples for biotin analysis were taken at different depths from the E. China Sea, the N. Pacific Ocean, and the bays and inlets along the Pacific coast of Japan. Biotin concentrations in surface waters were in the range from less than 0.1 ng/l up to 57.9 ng per l. The concentrations were generally high in surface waters, and rapidly decreased with depth down to 50 m. The vertical distribution of biotin followed closely the concentration of chlorophyll a, with high concentrations restricted to the euphotic layer. Biotin concentrations in surface waters were high during the summer, but in autumn and winter the concentrations decreased markedly. (Long-Battelle)
W73-05499

WILLEELLA ORDINATA BOERGESEN, 1930 (CHLOROPHYCEAE, CLADOPHORALES): FIRST RECORD FOR AMERICA,
C. van den Hoek, and N. de Rios.
Journal of Phycology, Vol 8, No 2, p 207-208, June 1972. 1 fig, 1 tab, 6 ref.

Descriptors: *Chlorophyta, *Systematics, South America, Aquatic plants, Nuisance algae, Sessile algae, Marine plants, Marine algae, Africa, Geographical regions.
Identifiers: *Willeella ordinata, India, Venezuela, Caribbean coast.

The tropical chlorophycea Willeella ordinata, known so far from 2 localities on the coast of northwest and southern India, and 2 localities on the coast of South Africa, is recorded for the first time from the Caribbean coast of Venezuela. The material from Venezuela is described and pictured, and it is compared with the holotype. (Long-Battelle)
W73-05503

AUTOMATIC WATER SAMPLER MONITORS POLLUTION LOW-COST, EASY-TO-BUILD UNIT IS REAL CONTRIBUTION TO YOUR LOCAL ECOLOGY GROUP,
F. B. Rakoff.
Popular Science, Vol 201, No 2, p 112, August 1972.

Descriptors: *Water sampling, *Water pollution, *Monitoring, Automation, Water pollution sources, Saline water, Freshwater, Water analysis.
Identifiers: *Automatic water sampler.

The construction of a low cost, easy-to-build automatic water sampler to monitor water pollution at different depths of rivers, lakes and sounds is described. The salient features of this device include: adjustable trigger-release line, lockable trigger-release bolt, sample depth determined by the distance between the hollow cylinder and bottom-sensor weight, and a bottom sensor that slackens the trigger release thus allowing spring tension to draw the stoppers into the cylinder. Water samples are recovered by removing the drain-tube paper clip and placing the tube in the storage vessel. (Byrd-Battelle)
W73-05504

MARINE GAMMARIDEA (CRUSTACEA: AMPHIPODA) FROM THE INDIAN REGION - FAMILY: AMPHILOCHIDAE,
N.S.S. Coll., Pandalam (India). Dept. of Zoology.
P. Rabindranath.
Hydrobiologia, Vol 39, No 4, p 509-526, July 31, 1972. 6 fig, 15 ref.

Descriptors: *Amphipoda, *Crustaceans, *Systematics, *Ecological distribution, Invertebrates, Marine animals, Classification, Littoral, Periphyton, Benthic fauna.
Identifiers: Gitanogeiton tropica, Gitanopsis subpusilla, Cyproiden ornata, Arthropods.

Three gammaridean amphipods coming u the family Amphilochidae are described and figured. Two of these are considered new. In the light of this study, J. L. Barnard's (1962) observations on the family are critically examined and a reassessment of the characters made use of in separating some of the genera under the family is made. (Holoman-Battelle)
W73-05506

STUDIES ON UNIONIDAE POPULATIONS FROM THE CRAPINA-JIJILA COMPLEX OF POOLS (DANUBE ZONE LIABLE TO INUNDATION),
Bucharest Univ. (Rumania). Faculty of Biology.
C. Tudorancea.
Hydrobiologia, Vol 39, No 4, p 527-561, July 31, 1972. 14 fig, 8 tab, 49 ref.

Descriptors: *Mussels, *Ecological distribution, *Secondary productivity, *Environmental effects, Animal populations, Aquatic environment, Spatial distribution, Energy budget, Trophic level, Migration, Organic matter, Clams, Mollusks, Invertebrates, Aquatic animals, Water quality, Biomass, Ecosystems, Water levels, Respiration, Dredging, Silts, Gastropods, Snails.
Identifiers: *Energy flow, *Unionidae, Macroinvertebrates, Species density, Unio pictorum, Substrates, Unio tunidus, Anodonta piscinalis, Anodonta cygnea, Pseudanodonta complanata, Pelecypoda, Bivalves, Sex, Pisidium henslowanum, Dreissena polymorpha, Monodacna pontica, Theodoxus fluviatilis, Theodoxus danubialis, Viviparus viviparus, Valvata piscinalis, Valvata pulchella, Lithoglyphus naticoides, Bithynia tentaculata, Fagotia acicularis, Fagotia esperi, Limnaea stagnalis, Coretus corneus, Gyraulus albus.

A study has been made of the structure, dynamics, and functioning of some Unionidae populations of

the Crapina-Jijila complex of pools, integrated into the zone liable to inundation of the Danube. Collections were made in 15 zones with a dredge fixed on a pole, to which was attached a wire net with meshes of about 3-4 mm. Samples were used to determine dynamics of density, abundance, and frequency of occurence. Qualitative and quantitative samples were used to determine growth, establish structure by ages, sizes and sexes, and to obtain data on reproductive biology. For the determination of energy flow characteristic of each population separately, Lindeman's trophic model was used; the quantity of energy released by respiration was computed using Ivelev's mean oxicaloric coefficient, equal to; 3.38 cal/mf 02. The composition of the silt was also determined. Of the five species of Unionidae present in the Crapina-Jijila complex of pools, the populations of Unio pictorum, Unio tumidus and Anodonta piscinalis were investigated as these species dominate in the respective ecosystems both in number as well as in biomass. The following conclusions were arrived at: (1) Density, biomass, incidence and abundance are greater in the Crapina populations than those of Jijila, owing to more favorable life conditions (smaller degree of silting, better water circulation, greater variety of the bottom). (2) Spatial distribution is influenced by water level determined by the Danube high flods, nature of the bottom and presence
W73-05507

WET DIGESTION VERSUS DRY ASHING FOR THE ANALYSIS OF FISH TISSUE FOR TRACE METALS,
Virginia State Water Control Board, Richmond.
J. Anderson.
Atomic Absorption Newsletter, Vol 11, No 4, p 88-89, July-August 1972. 3 tab, 4 ref.

Descriptors: *Heavy metals, *Trace elements, *Chemical analysis, Copper, Zinc, Chrominm, Cadmium, Lead, *Fish.
Identifiers: *Biological samples, *Tissue, *Dry ashing, *Wet digestion, Atomic absorption spectrophotometry, Sample preparation, Chemical recovery, Precision, Sampling Boat technique.

Fish samples for analysis were frozen and ground and divided for dry ashing and wet digestion. Ashing was performed at 500 C for 16 hours after which 5 ml of concentrated nitric acid and later, deionized water were added. Wet digestion was performed by adding 2 ml of perchloric acid and 10 ml of nitric acid, heating at 95 C until fats were completely broken down. Ten ml of deionized water was then added to samples. Metal concentrations were measured by direct aspiration into a Perkin-Elmer atomic absorption spectrophotometer. Lead was measured using the Sampling Boat technique. It is concluded from the results of the analysis for Zn, Cr, Cu, Cl, and Pb that the dry-ash method is much less time consuming in terms of manhours, can handle whale fish, has percent recoveries comparable to the wet digestion method, and produces less variation. Recoveries by each method exceeded 90 percent. (Little-Battelle)
W73-05511

ANALYSIS OF A CHLORINATED TERPHENYL (AROCLOR 5460) AND ITS DEPOSITION IN TISSUES OF COD (GADUS MORHUA),
Bedford Inst., Dartmouth (Nova Scotia).
R. F. Addison, G. L. Fletcher, S. Ray, and J. Doane.
Bulletin of Environmental Contamination and Toxicology, Vol 8, No 1, p 52-60, July 1972. 1 fig, 2 tab, 11 ref.

Descriptors: *Chemical analysis, *Pollutant identification, Path of pollutants, Methodology, Solvent extractions, Bioassay, Gravimetric analysis, Toxicity, Lipids, Absorption.
Identifiers: *Aroclor 5460, *Chlorinated terphenyls, *Cod, Fate of pollutants, Biological magnification, Gadus morhua, Retention, Animal tissues, Electron capture gas chromatography, Fluorescence spectrophotometry, Thin layer chromatography, Sample preparation, Detection limits, Gas liquid chromatography, Blood, Muscle, Brain, Liver, Gall bladder, Gills, Spleen, Kidneys, Heart, Gonads, Intestine, Stomach, Pyloric caeca.

A description is given of the analysis of Aroclor 5460 and its retention by cod (Gadus morhua) after feeding. Aroclor 5460 was extracted from cod tissue by homogenizing with n-hexane and blood samples were extracted with chloroform-methanol. Lipid was determined gravimetrically. The terphenyl was estimated by electron capture gas chromatography yielding a minimum level of 2.5 ng. The estimation of Aroclor 5460 by fluorescence spectroscopy and by TLC was briefly investigated; minimum detection levels were 0.5 ppm and 1 microgram, respectively. Two separate groups of starved cod were fed with a herring oil-Aroclor mixture and one group was kept for 70 days while being fed chunks of herring every 2 or 3 days after an initial 7-day starvation period. Various tissues and organs were analyzed for lipid and Aroclor 5460. Recovery experiments with Aroclor 5460 showed that extraction efficiency was better than 90 percent. Recovery from Florisil columns was in the range 95-105 percent. In experiment 1 Aroclor 5460 was found in all tissues of those fish fed the materials, except for one blood sample. The levels varied widely between different fish with the liver being the organ richest in Aroclor 5460. Levels expressed as concentrations in fat were widely spread; blood contained the highest levels of Aroclor 5460/lipid and muscle the lowest. In the second experiment appreciable amounts remained in tissues after a period of 70 days following the feeding of Aroclor 5460. Mean levels were considerably lower than those in Expt. 1, but variance was such that reduction in Aroclor 5460 levels was often not significant (Student's test) over this period. Aroclor 5460 levels in liver was significantly lower. An overall reduction in liver lipid might be expected to result in some mobilization of Arcoclor 5460 from liver tissues and possibly in its excretion from the fish. (Holoman-Battelle)
W73-05514

MASS SPECTROMETRIC IDENTIFICATION OF MIREX RESIDUES IN CRUDE EXTRACTS AND IN THE PRESENCE OF POLYCHLORINATED BIPHENYLS,
Georgia Univ., Athens. Dept. of Entomology.
S. Uk, C. M. Himel, and T. Dirks.
Bulletin of Environmental Contamination and Toxicology, Vol 8, No 2, p 97-104, August 1972. 3 fig, 10 ref.

Descriptors: *Mass spectrometry, *Polychlorinated biphenyls, *Pesticide residues, Sample preparation, Pollutant identification, Chlorinated hydrocarbon pesticides.
Identifiers: *Fat, *Mirex, *Chemical interference, Cleanup, Biological samples, Detection limits, Chlorinated hydrocarbons, Aroclor 1254, Mass spectra.

One, 5, 20, and 50 micrograms of Mirex and Aroclor 1254 were added to 5 g of pork fat for use in investigating means to improve detection of Mirex in biological samples containing PCB's. The samples were prepared by grinding in a mortar and pestle with purified sand and benzene, treating the combined benzene fractions with concentrated H2SO4, separating the benzene layer and filtering over glass wool-Na2SO4, concentrating it in a stream of dry air, washing into a Pasteur pipette to concentrate to less than 5 microliters, and transferring it to a capillary tube cut to fit the mass spectrometer probe. Analysis showed that a mixture of 500 micrograms of Mirex and 500 micrograms of Aroclor 1254 added to 5 g port fat was easily detected by low voltage MS in the crude extract after it was treated with concentrated H2SO4. The most favorable probe temperatures were 90-100 C. Despite numerous extraneous peaks from the fat particularly at m/e below 200, mass scans in this temperature range showed minimum interference with ions of Mirex and/or PCB's. The presence of extraneous peaks proved that the treatment of pork fat extracts with H2SO4 did not eliminate organic impurities. The results show the feasibility of concentrating pesticide residue extracts to microliter-volume for positive confirmation by mass spectrometry. For relatively stable compounds with low vapor pressure such as Mirex, the sample in an organic solvent such as benzene can be introduced into the glass capillary tube plugged with glass wool 1 to 2 weeks in advance before mass spectrometric testing. Analytical sensitivity remains a problem since detection of Mirex and/or Aroclor 1254 in sample extracts containing 1, 5, or 20 micrograms of each chemical was not possible. (Little-Battelle)
W73-05515

COLLABORATIVE STUDY OF A METHOD FOR DETERMINING LEAD IN PLANT AND ANIMAL PRODUCTS,
Texas A and M Univ., College Station. Dept. of Agricultural Analytical Services.
W. L. Hoover.
Journal of the Association of Official Analytical Chemists, Vol 55, No 4, p 737-740, July 1972. 2 tab, 3 ref.

Descriptors: *Lead, *Foods, *Pollutant identification, Heavy metals, Chemical analysis, Trace elements, Chemical precipitation, Water pollution, Aqueous solutions, Separation techniques.
Identifiers: *Atomic absorption spectrophotometry, *Collaborative studies, Plant products, Interlaboratory tests, Sample preparation, Biological samples, Animal products, Coprecipitation, Coefficient of variation, Dissolution.

A method for the determination of lead in food products was collaboratively studied. The method involves co-precipitation of lead with strontium sulfate, conversion to carbonate, dissolution in nitric acid, and determination by atomic absorption spectrophotometry. Eight collaborating laboratories reported analytical results for 24 test samples. Results indicated that the systematic error was essentially the same as the random error at the 99 percent level. Acceptable coefficients of variation were observed. The method has been adopted as official first action. (Byrd-Battelle)
W73-05518

SIMPLE, RAPID DIGESTION TECHNIQUE FOR THE DETERMINATION OF MERCURY IN FISH BY FLAMELESS ATOMIC ABSORPTION,
Food and Drug Administration, Brooklyn, N.Y.
W. Holak, B. Krinitz, and J. C. Williams.
Journal of the Association of Official Analytical Chemists, Vol 55, No 4, p 741-742, July 1972. 4 tab, 4 ref.

Descriptors: *Mercury, *Fish, Aeration, Temperature, Pollutant identification, Heavy metals, Pikes, Chemical analysis.
Identifiers: *Flameless atomic absorption, *Sample preparation, *Chemical digestion, Atomic absorption spectrophotometry, Absorbance, Tuna, Chemical recovery, Mineral acids, Biological samples.

A simple and rapid digestion technique is described for the determination of mercury in fish by flameless atomic absorption. The sample is digested with nitric acid in a closed system in a commercially available vessel made of Teflon. A 30-min digestion at 150 C is sufficient to convert the mercury to an inorganic form so that it can be reduced to the elemental state, aerated, and deter-

mined by atomic absorption. The proposed digestion compares favorably with the official AOAC sulfuric-nitric-perchloric acid digestion. (Byrd-Battelle)
W73-05519

IMPROVED EXTRACTION PROCEDURE FOR DIMETRIDAZOLE AS APPLIED TO ASSAY OF SAMPLES OF ANIMAL ORIGIN,
National Animal Parasite Lab., Beltsville, Md.
P. C. Allen.
Journal of the Association of Official Analytical Chemists, Vol 55, No 4, p 743-745, July 1972. 1 tab, 1 fig, 17 ref.

Descriptors: *Solvent extractions, *Polarographic analysis, *pollution identification, Separation techniques, Pesticide residues, Solvents, Treatment, Chemical analysis, Electrodes, Equipment, Sampling, Digestion, Antibotics.
Identifiers: *Drugs, *Dimetridazole, *Biological samples, Sample preparation, Precision, Tissue, 1 2-dimethyl-5-mitroimidazole, Benzene, Liver, Kidney, Muscle, Fat, Feces, Chemical recovery.

An extraction procedure was used to remove dimetridazole (a drug residue) from various biological tissues for polarographic analysis. Samples for analysis, including swine liver and guinea pig liver, kidney, muscle, fat, and feces were homogenized with benzene in the presence of a base to convert all dimetridazole to free base and to form a single phase liquid extract. The extract of each sample was then spiked with 3 concentrations of dimetridazole (267, 33.3, and 1 ppm) and analyzed polarographically. Analysis of samples containing 267 and 33.3 ppm showed average recoveries of 88.2 percent (range, 70.5 to 99.2 percent) and 87.8 percent (range, 78.6 to 101 percent), respectively. The average coefficient of variation for detection of these levels of drug was 3.33 percent. Under assay conditions, 1 ppm dimetridazole in tissues could not be detected. (Long-Battelle)
W73-05520

QUANTITATIVE FLUORODENSITOMETRIC MEASUREMENTS OF AFLATOXIN B1 WITH A FLYING-SPOT DENSITOMETER. I. FLUORODENSITOMETRIC STUDY OF THE BEHAVIOR OF AFLATOXIN B1 STANDARD SPOTS ON DIFFERENT TYPES OF SILICA GEL,
P. R. Beljaars, and F. H. M. Fabry.
Journal of the Association of Official Analytical Chemists, Vol 55, No 4, p 775-780, July 1972. 3 fig, 1 tab, 10 ref.

Descriptors: *Chemical analysis, *Fluorescence, Water pollution sources, *Pollutant identification, Fungi.
Identifiers: *Aflatoxin B1, *Fluorodensitometry, *Silica gel, Mycotoxins, Thin layer chromatography, Reflectance flying spot densitometer, Coefficient of variation, Metabolites, Precision.

A description of a method for the quantitative fluorodensitometric measurements of aflatoxin B1 with a flying-spot densitometer and a fluorodensitometric study of the behavior of aflatoxin B1 standard spots on different types of silica gel are presented. Three different types of silica gel layers were spotted with standard aliquots of aflatoxin B1 covering a range of 0.4-20 ng. Silica gel H plates were developed with a mixture of chloroform-trichloroethylene-n-amyl alcohol-formic acid (80 plus 15 plus 4 plus 1), while silica gel G and MN-G-HR plates were developed with a mixture of chloroform-acetone (90 plus 10). Sharp and defined separation patterns for aflatoxins B1, B2, G1, and G2 were recorded on H and MN-G-HR plates, while unsatisfactory separation was found on G plates. The relationship between peak area and concentration was linear for H and MN-G-HR plates, but not for G plates. Variations of plus or minus 15-20 percent were calculated among the fluorescence of standard B1 spots between plates with same sorbent layers. Co-efficients of variation of plus or minus 5-7 percent for single densitometric measurements on one plate under normal routine conditions were calculated for a series of 3 or 4 standard aflatoxin B1 spots ranging from 1 to 4 ng on H and MN-G-HR plates. Coefficients of variation of plus or minus 11-12 percent were calculated for G plates. Results obtained in this investigation are compared with those found by previous investigations. (Byrd-Battelle)
W73-05521

RAPID METHOD FOR THE QUANTITATIVE MEASUREMENT OF NUMEROUS PHARMACEUTICALLY IMPORTANT AMINES,
Mogul Corp., St. Louis, Mo. Heun/Norwood Div.
W. R. Matthew, H. C. Browne, and J. B. Weber.
Journal of the Association of Official Analytical Chemists, Vol 55, No 4, p 789-793, July 1972. 1 fig, 4 tab, 19 ref.

Descriptors: *Methodology, *Chemical analysis, Antibiotics (Pesticides), Colorimetry, Nitrogen compounds, Ammonium compounds, Spectrophotometry, Separation techniques, Solvent extractions, Pollutant identification, Water pollution sources, Measurement, Color reaction.
Identifiers: *Amines, *Pharmaceuticals, Alkaloids, Sample preparation, Phenlpropanolamine HCl, d-Amphetamine sulfate, 1-Amphetamine base, dl-Amphetamine sulfate, Procaine HCl, 9-Aminoacridine HCl, Yohimbine HCl, Phenylephrine HCl, Ephedrine HCl, Pseudoephedrine HCl, Methamphetamine HCl, Naphazoline HCl, Isoproterenol, Dibucaine HCl, Dextromethorphan HBr, Phenyltolozamine dihydrogen citrate, Codeine phosphate, Pramoxine HCl.

A simplified variation of the bromothymol blue method has been used successfully to analyze numerous pharmaceutically important amines. A single benzene extraction of the yellow amine-dye complex is made possible by buffering the dye solution at pH 7.0 and by maintaining the organic-to-aqueous ratio at not less than 3:1 so that a complete transfer of the amine-dye complex into the benzene phase is obtained. Any variation in the solubility of the complex is compensated for by the simultaneous determination of a known standard of equal volume. The solutions are read spectrophotometrically at 430 nm. This method is presently used for the routine analysis of 29 aromatic amines in pharmaceutical products and takes only about 15 minutes to complete. (Long-Battelle)
W73-05522

COLLABORATIVE STUDY OF EXTRACTION METHOD FOR PARAQUAT AEROSOLS CONTAINING HYDROCARBONS,
Chevron Chemical Co., Richmond, Calif.
A. A. Carlstrom.
Journal of the Association of Official Analytical Chemists, Vol 55, No 4, p 857-859, 1972. 1 tab, 5 ref.

Descriptors: *Separation techniques, *Organic compounds, *Paraquat, *Aerosols, Sensitivity, Methodology, Evaluation, Data analysis, Chemical analysis, Oil, Legislation, Pesticides, Solvent extractions, Solvents, Quality control.
Identifiers: Interlaboratory tests, n-pentane, Method validation, Collaborative studies, Data interpretation.

A method for eliminating hydrocarbon interference during colorimetric analysis of paraquat aerosols was evaluated by collaborative tests performed by 18 analysts. The method basically consisted of partitioning the oil into n-pentane leaving a sodium sulfate-alcohol-water phase. The results of the analyses showed a standard deviation of 0.011. The official method was therefore revised to include this method of eliminating hydrocarbon interferences in aerosols. (Snyder-Battelle)
W73-05523

KINETICS OF CHLOROPHYLL A AND PLASTOQUINONE A: CHANGES IN RESPONSE TO LIGHT INTENSITY,
Montana Univ., Missoula. Dept. of Botany.
For primary bibliographic entry see Field 05C.
W73-05526

THE FRESHWATER DIATOM CYMBELLA CURSIFORMIS NOM. NOV.,
Ohio State Univ., Columbus. Dept. of Botany.
T. L. Hufford, and G. B. Collins.
Journal of Phycology, Vol 8, No 2, p 184-187, June 1972. 10 fig, 4 ref.

Descriptors: *Diatoms, *Plant morphology, *Systematics, Bioindicators, Nutrients, Ohio, Sampling, Water chemistry, Water temperature, Iron, Magnesium, Calcium, Sodium, Environmental effects, Potassium, Silicon, Phosphates, Sulfates, Alkalinity, Bicarbonates, Hydrogen ion concentration, Water quality, Electron microscopy, Chrysophyta.
Identifiers: *Cymbella cursiformis, Scanning electron microscopy, Diatometers, Sample preparation, Photomicrographs, Light microscopy, Cedar Bog, Achnanthes minutissima, Fragilaria construens, Diatoma tenue var elongatum, Synedra filiformis var exilis, Cymbella cistula.

Diatometers and hand sampling were used to collect samples of the pennate diatom Cymbella cursiformis from Cedar Bog in Ohio. The living material was cleaned by a hydrogen peroxide-potassium dichromate method and portions were examined with light microscope. Other portions were dried, gold plated in a vacuum evaporation, and examined with a scanning electron microscope. This report describes the morphology, ecology, and taxonomy of this diatom. Differences from Cymbella cistula were delineated and the taxon was raised to specific rank. (Mortland-Battelle)
W73-05528

SOME MORPHOLOGICAL VARIATIONS IN THE DIATOM CYMBELLA CISTULA,
Ohio State Univ., Columbus. Dept. of Botany.
T. L. Hufford, and G. B. Collins.
Journal of Phycology, Vol 8, No 2, p 192-195, June 1972. 24 fig, 1 tab.

Descriptors: *Diatoms, *Plant morphology, *Systematics, Bioindicators, Aquatic algae, Ohio, Epiphytology, Chrysophyta, Electron microscopy.
Identifiers: *Cymbella cistula, Scanning electron microscopy, Sample preparation, Cedar Bog, Caldwell's Pond, Interference contrast microscopy, Light microscopy.

Several populations of Cymbella cistula were collected from Cedar Bog and Caldwell's Pond in Ohio and studied. An aliquot of each sample was examined in the living condition and the remainder was cleaned by a hydrogen peroxide-potassium dichromate method before examination. Examination was by bright field and Nomarski interference contrast microscopy and by scanning electron microscopy. An epiphytic population contained smaller specimens than any recently reported. These specimens were as small as 24 by 11 microns. They could be mistaken for C. cistula var. maculata. However, they have isolated puncta and somewhat coarser striae than that variety. (Mortland-Battelle) .
W73-05529

ECOLOGICAL IMPLICATIONS OF CULTURE STUDIES ON NEREOCYSTIS LEUTKEANA, .
Washington Univ., Seattle. Dept. of Botany.
For primary bibliographic entry see Field 05C.
W73-05530

THE USE OF A HAIR LOOP TO ISOLATE UNICELLS INTO PURE CULTURE,
Rutgers - The State Univ., New Brunswick, N.J. Dept. of Botany.
P. R. Edmonds.
Journal of Phycology, Vol 8, No 2, p 205-206, June 1972. 1 fig, 5 ref.

Descriptors: *Cultures, *Isolation, *Algae, *Laboratory equipment, Separation techniques, Methodology, Design, Diatoms, Euglena, Chlorella, Chlorophyta, Plankton, Analytical techniques.
Identifiers: Cylindrotheca closterium, *Hair loop, Unialgal culture, Culturing techniques.

A method is described for forming and using a microhair loop to isolate algal unicells into pure culture. Loops made from the distal end of cat vibrissiae are fine enough to make a loop of 50 microns or less. The loop is most useful for relatively large cells like Cylindrotheca closterium (25 to 100 microns) and Euglena (57 microns long, 24 microns wide); however, it has been used to isolate cells as small as 5 to 10 microns such as Chlorella. Advantages of the loop technique over conventional mechanical methods are described. (Long-Battelle)
W73-05531

CHEMISTRY OF PESTICIDES,
Moscow State Univ. (USSR).
For primary bibliographic entry see Field 05B.
W73-05532

AN IMPROVED GAS CHROMATOGRAPHIC METHOD FOR THE ANALYSIS OF 5,6--DICHLORO-2-TRIFLUOROMETHYLBEN ZIMIDAZOLE IN SOIL,
Pennsylvania State Univ., University Park. Pesticide Research Lab.
C. D. Ercegovich, S. Witkonton, and K. B. Steen.
Journal of Agricultural and Food Chemistry, Vol 20, No 3, p 734-736, May-June 1972. 1 fig, 2 tab, 4 ref.

Descriptors: *Soil analysis, *Separation techniques, Gas chromatography, Chlorinated hydrocarbon pesticides, Pesticides, Degradation (Decomposition).
Identifiers: *5 6-Dichloro-2-trifluoromethylbenzimidazole, *Sample preparation, *Electron capture gas chromatography, Chemical interference, Lovozal, NC-2983.

An improved method was developed for the extraction of 5,6-dichloro-2-trifluoromethylbenzimidazole (NC-2983) from soil. This chemical is a major degradation product in the soil of the acaricide fenazaflor, 5,6-dichloro-1-phenoxycarbonyl-2-trifluoromethylbenzimidazole (Lovozal). NC-2983 was extracted with a mixture of methylene chloride and isopropyl alcohol. Interfering soil materials were removed by means of alkaline saline washing of the organic phase. Electron capture gas chromatography employing a 3 percent OV-17 column was used to determine the quantity of NC-2983 in the final sample preparations. This modified procedure is faster and simpler to perform than a more entailed acidic methanolic extraction procedure, but is equal to it in sensitivity and reliability. (Little-Battelle)
W73-05535

RECENT APPLICATIONS OF MASS SPECTROMETRY AND COMBINED GAS CHROMATOGRAPHY-MASS SPECTROMETRY TO PESTICIDE RESIDUE ANALYSIS,
Food and Drug Administration, Perrine, Fla. Div. of Pesticides.
F. J. Biros.
Residue Reviews, Vol 40, p 1-63, 1971. 4 fig, 4 tab, 160 ref.

Descriptors: *Phosphothioate pesticides, *Chlorinated hydrocarbon pesticides, *Phenolic pesticides, *Gas chromatography, *Triazine pesticides, *Carbamate pesticides, *Triazole pesticides, *Polychlorinated biphenyls, *Urea pesticides, Degradation (Decomposition), Metabolism, Isolation, Soil analysis, Pesticides, Organophosphorus pesticides, Chromatography, Separation techniques, Pesticide residues, Soils, Biodegradation, Laboratory equipment, Instrumentation, Aroclors, DDD, DDE, DDT.
Identifiers: *Mass spectrometry, Biological samples, Urine, Blood, Tissue, Metabolites, Thin layer chromatography, Photodecomposition, Chlorinated hydrocarbons, Mass spectra, Aroclor 1264.

Mass spectral fragmentation studies of several classes of organic pesticidal compounds are outlined. These include the organochlorine and organophosphate classes of insecticides, carbamates, uracil, and triazine herbicides, and several miscellaneous classes including nicotinoids, rotenoids, and phenoxyalkanoic acids. The available literature relating to the application of mass spectrometry in the characterization of individual pesticide residues has been reviewed with emphasis on studies involving animal metabolism of pesticides, plant- and soil-induced chemical alteration of pesticidal materials, and the photodecomposition of pesticides. Techniques for the separation, isolation, and collection of individual pesticide residues for subsequent mass spectral analysis have been tabulated, with special reference to gas chromatographic and thin-layer chromatographic trapping devices. A discussion is presented on the various types of coupling techniques used for interfacing a gas chromatograph with a mass spectrometer. Included are methods utilizing direct coupling of gas chromatographic columns as well as those employing carrier gas separator interfaces operating on diffusion or effusion principles. Other mass spectrometric instrumental considerations are also outlined, particularly those associated with enhancement of sensitivity, identification of multicomponent gas chromatographic peaks, and the use of mass spectrometry as a gas chromatographic detector in the confirmation of chemical identity. Recent applications of the combined technique to the confirmation of pesticide residues and the characterization of metabolites and photodecomposition products are discussed. (Little-Battelle)
W73-05536

METHODS AND MATERIALS FOR FLUORIDE ANALYSIS,
Environmental Protection Agency, Washington, D.C. Div. of Water Hygiene.
E. Bellack.
Journal American Water Works Association, Vol 64, No 1, p 62-66, January 1972. 6 fig, 6 tab, 1 ref.

Descriptors: *Fluorides, *Methodology, *Pollutant identification, *Chemical analysis, *Water analysis, *Photometry, *Laboratory equipment, Halids, Inorganic compounds, Aqueous solutions, Electrodes, Alkalinity, Aluminum, Chlorides, Iron, Phosphates, Sulfates, Chlorine, Color, Turbidity, Instrumentation.
Identifiers: *Alizarin Visual Method, *Fluoride electrode, Nessler-tube techniques, Scott-Sanchis method, Standard methods, Precision, Ion selective electrodes.

The three analytical methods described in the 13th edition of Standard Methods for fluoride determination are discussed. The three methods are: Alizarin Visual (Scott-Sanchis) or Nessler-tube technique, Photometric (SPADNS) Method, Electrode Method. The methods are described and a list is given of the equipment to utilized with each method. These factors which will govern the ultimate choice of the analytical method to be used are also described. (Holoman-Battelle)
W73-05537

PHENOLIC KETONES AS INDICATORS FOR THE DIRECT NTA TITRATION OF IRON,
Gujarat Univ., Ahmedabad (India).
M. N. Desai, B. M. Desai, C. R. Vora, and M. H. Gandhi.
Zeitschrift fur Analytische Chemie, Vol 258, No 2, p 127-128, January 24, 1972. 3 ref.

Descriptors: *Iron, *Volumetric analysis, *Aqueous solutions, *Nitrilotriacetic acid, Heavy metals, Color reactions, Chemical reactions, Chemical analysis, Cations, Anions, Alkali metals, Alkaline earth metals, Hydrogen ion concentrations, Selectivity, Potassium, Chlorides, Bromides, Nitrates, Sulfates, Beryllium, Zinc, Cadmium, Aluminum, Nickel, Magnesium, Calcium, Strontium, Lead, Chromium, Cobalt, Copper, Phosphates.
Identifiers: *2 4-dihydroxy-acetophenone, * 4-dihydroxy-propiophenone, *Phenolic ketones, Chemical indicators, Chemical interference, Metal complexes, 2 4-dihydroxy-butyrophenone, Barium, Uranyl, Palladium, Silver, Thorium, Zirconium, Perchlorates, Ammonium ions, Vanadates, Molybdates, Tungstates, Pyrocatechol violet, N-benzoyl-N-phenyl-hydroxylamine.

The use of 2,4-dihydroxy-acetophenone and 2,4-dihydroxy-propiophenone is reported as indicators for the direct NTA titration of ferric ions. There is a sharp color change on titration of ferric ions with NTA from violet to yellow at the end-point when employing the two above indicators. Iron can be estimated accurately in the pH range 1.5-2.5. The titrations of synthetic solutions were carried out at pH 1.0 at 2.8 mg concentration of iron, 100 times excess of Na (plus), K (plus), NH4 (plus), Cl (minus), Br (minus), CL04 (minus), NO3 (minus, SO4 (2 minus), 50 times excess of Be (2 plus), UO2 (2 plus), 10 times excess of Be (2 plus), UO2 (2 plus), 20 times excess of Pd (2 plus), 10 times excess of Ag (plus), 5 times excess of Zn (2 plus), Cd (2 plus), Al (3 plus), Ni (2 plus), Mg (2 plus), and twice the excess of Ca (2 plus), Sr (2 plus), Ba (2 plus), Pb (2 plus), Cr (3 plus), Co (2 plus) could be tolerated. Cu (2 plus), Th (4 plus), Zr (4 plus) and anions forming stable complexes with iron such as phosphates, vanadates, molybdates and tungstates interfered at all levels. The suggested procedure to be followed is outlined. The suggested indicators are superior to pyrocatechol violet and N-benzoyl-N-phenyl-hydroxylamine in that titrations can be carried out in the pH range 1.0-1.5, and are more selective. (Holoman-Battelle)
W73-05538

ALIZARIN RED S AS METALLOCHROMIC INDICATOR IN THE COMPLEXOMETRIC TITRATION OF LEAD AND COPPER,
Punjabi Univ., Patiala (India). Dept. of Chemistry.
R. P. Singh.
Zeitschrift fur Analytische Chemie, Vol 258, No 2, p 125, January 24, 1972.

Descriptors: *Volumetric analysis, *Lead, *Copper, *Color reactions, *Aqueous solutions, *Chemical analysis, Heavy metals, Calcium, Chemical reactions, Magnesium, Strontium, Pollutant identification, Separation techniques, Methodology, Water analysis.
Identifiers: *Complexometric titration, *Alizarin Red S, *Chemical indicators, Metal complexes, Chemical interference, Barium, EDTA, Masking, Thiourea, Potassium fluoride.

That the pink 1:1 complex of Alizarin Red S with Cu or Pb can be easily decomposed by EDTA at pH 5.5-6.0 has been utilized in the complexometric titration of these metals. Since the indicator acquires a pinkish tinge in that pH range the use of methylene blue is necessary as a screening dye for the determination of lead. Calcium can cause interferences in the detection of the end-point. Warming the solution and the addition of KF improve tolerance in the determination of lead and copper, respectively. Mg and Sr do not interfere; Ba inter-

feres only in the titration of copper. In the determination of lead, copper, and mercury may be masked by thio-urea. KF has been found suitable for masking iron and aluminum in the determination of copper. The procedures for titrating lead and copper are outlined. (Holoman-Battelle)
W73-05539

1- (2-QUINOLYLAZO)-2-PHENANTHROL (QAP) AS A VISUAL INDICATOR FOR THE DETERMINATION OF COPPER AT EDTA,
Delhi Univ. (India). Dept. of Chemistry.
R. N. Virmani, B. S. Garg, and R. P. Singh.
Zeitschrift fur Analytische Chemie, Vol 258, No 2, p 125-126, January 24, 1972.

Descriptors: *Copper, *Chemical analysis, *Aqueous solutions, *Pollutant identification, *Volumetric analysis, Methodology, Water analysis, Heavy metals, Anions, Cations, Chemical reactions, Color reactions, Temperature, Hydrogen ion concentration, Chlorides, Bromides, Iodides, Fluorides, Nitrates, Nitrites, Phosphates, Calcium, Magnesium, Strontium, Manganese, Cobalt, Zinc, Cadmium, Mercury, Aluminum, Iron.
Identifiers: *1- (2-Quinolylazo)-2-phenanthrol, *Chemical indicators, Chemical interference, Metal complexes, EDTA, Thiocyanates, Iodates, Borates, Citrates, Tartrates, Oxalates, Barium, Palladium.

1- (2-Quinolylazo)-2-phenenthrol (QAP) has been found to be a suitable indicator for the titration of Cu with EDTA. The pH g the EDTA solution is adjusted to neutral (7.0) with a sodium acetate/acetic acid buffer after which diozane is added to keep the ligand and complex in solution, followed by two drops of QAP. The copper sample solution is titrated after the addition of each. With a 30 sec wait between each drop near the end-point, a sharp color change from yellow to blue will be obtained. The titration can be carried out over wide pH and temperature ranges of 6.0-8.9 and 20-50 C, respectively. The concentration at which foreign ions can be tolerated is given. Serious interferences were caused by Co (III), Zn, Cd, Hg, Al, Fe (III), and Pd. Sensitivity of the proposed method is much higher than that obtained by the use of 1- (2-pyridylazo)-2-naphthol. (Holoman-Battelle)
W73-05540

PRINCIPAL-COMPONENT ANALYSIS APPLIED TO CHROMATOGRAPHIC DATA,
Purdue Univ., Lafayette, Ind. Dept. of Chemistry.
For primary bibliographic entry see Field 02K.
W73-05541

ULTRASONIC NEBULIZATION IN ATOMIC ABSORPTION SPECTROPHOTOMETRY,
Colorado State Univ., Fort Collins. Dept. of Chemistry.
T. R. Copeland, K. W. Olson, and R. K. Skogerboe.
Analytical Chemistry, Vol. 44, No. 8, p 1471-1473, July 1972. 3 fig, 1 tab, 18 ref.

Descriptors: Laboratory equipment, *Heavy metals, *Aqueous solutions, *Water analysis, *Hardness (Water), Sodium chloride, Cadmium, Magnesium, Lead, Zinc, Spectrophotometry, Instrumentation, Metals.
Identifiers: Detection limits, *Atomic absorption spectrophotometry, *Ultrasonic nebulizers, Silver, Atomic absorption, Nebulizers, Efficiencies, Precision, Chemical interference.

A Tomorrow Enterprises ultrasonic nebulizer was coupled directly to the nebulizer chamber of a Techtron Model AA5 atomic absorption unit to study possible improvements in performance. Samples of distilled water spiked with Ag, Cd, Mg, Pb, or Zn were analyzed and the results compared with those obtained when a pneumatic nebulizer was used. The ultrasonic unit was about 3.5 times more efficient than the pneumatic system (35 percent versus 10 percent). Detection limits were improved from 1.5 to 3.1 times. To compare the two systems with actual samples, the effects of varying the salt or hardness concentration were studied. Standards for Ag, Zn, and Pb in 0.1 F nitric acid were doped with NaCl and CaCo3 to approximate natural water. Three natural waters with varying hardness were also analyzed. The ultrasonic nebulizer enhanced the signal as previously; however, precision was poorer with both nebulizers for samples doped with NaCl or CaCo3. It was concluded that the ultrasonic nebulizer provides increased analytical sensitivity for a variety of elements in aqueous samples. (Little-Battelle)
W73-05542

AN EASILY CONSTRUCTED ALKALI FLAME IONIZATION DETECTOR,
Sun Oil Co., Marcus Hook, Pa.
W. H. Stewart.
Analytical Chemistry, Vol. 44, No. 8, p 1547-1548, July 1972. 3 fig, 6 ref.

Descriptors: *Gas chromatography, *Hydrogen sulfide, Nitrogen compounds, Phosphorus compounds, Sulfur compounds, Organic compounds, Solvents, Laboratory equipment, Sulfides, Construction materials, Design construction, Analytical techniques, Chromatography, Equipment.
Identifiers: *Alkali flame ionization detector, *Benzene, *Trimethyl-pyridine, *Dichlorobenzene, *Ethyl benzoate, *Tridecane, *Azobenzene, *Carbon disulfide, Chlorinated hydrocarbons, Organic solvents, Flame ionization detector.

An alkali flame ionization detector (AFID) for enchancing GC response to N, P, S, and halogenated compounds may be easily constructed from 1/16-inch stainless steel front ferrules. Using a 1/2-inch die, salt (K2SO4, KBr, RbSO4, or a 1:1 mixture RbSO4 and KBr) is pressed into the ferrules at 16,000 psi for 20 minutes. As many as 11 detectors can be pressed at one time. After pressing, the salt is bored to 0.020 inch for positive response mode or 0.040 inch for negative response mode and counterbored to fit over the jet tip in the flame ionization detector. After five days of use, the detector showed no visual degradation and minimal weight loss. A six-component mixture containing benzene, trimethyl-pyridine, dichlorobenzene, ethyl benzoate, normal tridecane, and azobenzene was chromatographed with and without a KBr AFID in the gas chromatograph. The AFID discriminated against nonnitrogenous compounds while also providing some enhancement of the nitrogen compounds. In the sulfur mode, it is possible to detect compounds such as hydrogen sulfide and carbon disulfide which give no response with a standard FID. (Little-Battelle)
W73-05543

EVALUATION OF PRECISION OF QUANTITATIVE MOLECULAR ABSORPTION SPECTROMETRIC MEASUREMENTS,
Michigan State Univ., East Lansing. Dept. of Chemistry.
For primary bibliographic entry see Field 07B.
W73-05544

MULTIELEMENT ANALYSIS OF NATURAL WATERS BY NEUTRON ACTIVATION, GROUP CHEMICAL SEPARATIONS, AND GAMMA-RAY SPECTROMETRIC TECHNIQUES,
Battelle-Northwest, Richland, Wash. Pacific Northwest Lab.
T. M. Tanner, L. A. Rancitelli, and W. A. Haller.
Water, Air and Soil Pollution, Vol. 1, No. 2, p 132-143, April 1972. 3 fig, 4 tab, 23 ref.

Descriptors: *Pollutant identification, *Chemical analysis, *Water analysis, *Trace elements, *Radioactivity techniques, Gamma rays, Heavy metals, Alkali metals, Alkaline earth metals, Neutron activation analysis, Potable water, Separation techniques, Gold, Cesium, Chlorine, Cobalt, Chromium, Copper, Mercury, Potassium, Iron, Manganese, Molybdenum, Sodium, Nickel, Zinc, Strontium, Bromine, Water chemistry, Waste water (Pollution), Irradiation, Sewage.
Identifiers: *Thermal neutron activation, Ion exchange resins, Errors, Sensitivity, Chemical interference, Sample preparation, Precision, Detection limits, Rare earth metals, Gallium, Barium, Silver, Arsenic, Tin, Uranium, Tungsten, Cerium, Indium, Iridium, Lanthanum, Praseodymium, Rubidium, Antimony, Selenium, Scandium, Samarium, Tantalum, Tellurium, Greenland, Eropium.

A multielement analytical technique of thermal neutron activation of frozen water samples has been developed and applied to the studies of natural waters. A rapid group chemical separation utilizing ion exchange resins and a precipitation step to reduce Na-24 and K-42 interferences, followed by gamma-ray analysis of the fractions with Ge (Li) and multiparameter NaI (Tl) systems, permits the simultaneous measurement of a large number of trace constituents. Samples of river water, rain water, processed sewage water and Greenland ice were analyzed for 19 trace elements - Ag, As, Br, Cl, Co, Cs, Cr, Cu, Fe, Hg, K, Mn, Na, Rb, Sb, Sc, Se, U, and Zn. These elements were detected at orders of magnitude below maximum allowable concentrations for drinking water. The errors associated with this method are due mainly to counting statistics. The data have been used in studies of trace element concentration factors in aquatic biota, precipitation scavenging processes, and environmental pollution. (Snyder-Battelle)
W73-05545

AMMONIUM, NITRATE, AND TOTAL NITROGEN IN THE SOIL WATER OF FEEDLOT AND FIELD SOIL PROFILES,
Agricultural Research Service, Lincoln, Nebr. Soil and Water Conservation Research Div.
For primary bibliographic entry see Field 02G.
W73-05550

EFFECT OF TURBULENCE ON BOD TESTING,
Windosr Univ. (Ontario). Dept. of Civil Engineering.
H. I. Ali, and J. K. Bewtra.
Journal Water Pollution Control Federation, Vol 44, No 9, p 1798-1807, September 1972. 8 fig, 5 tab, 19 ref.

Descriptors: *Biochemical oxygen demand, *Measurement, *Turbulence, *Sewage effluents, Evluation, Water analysis, Waste water (Pollution), Dissolved oxygen, Oxygen demand, Dissolved oxygen analyzers, Biological treatment, Waste water treatment.
Identifiers: Winkler method.

Samples were collected from raw, settled, and biologically treated wastewater to determine the influence of mixing (turbulence) on the biooxidation rate of substrates normally laboratory tested by 5-day BOD analysis. Two sets of standard BOD bottles were inoculated and all tests conducted utilized the 'Standard Methods' procedure. The first set was kept under quiescent conditions while the second set was continuously mixed with magnetic stirrers. In order to maintain test validity, DO was measured by an oxygen probe and by the Winkler method. Continuous recording from an incubated bottle was also attempted with a fixed probe but poor readings resulted. The BOD progression studies showed a significant increase in 5-day BOD values if contents were continuously stirred during analysis. Rate constant values showed significant increases in all samples except the treated

effluent, while increase in ultimate carbonaceous oxygen demand was significant only in the treated effluent samples. Data obtained under quiescent conditions should, therefore, be carefully interpreted especially in applying wastewater treatment techniques. (Mackan-Battelle)
W73-05553

ION SELECTIVE ELECTRODES. PART I. A STUDY OF THE FACTORS INVOLVED IN THE CONSTRUCTION OF A HETEROGENEOUS ION SELECTIVE ELECTRODE,
Atomic Weapons Research Establishment, Aldermaston (England).
For primary bibliographic entry see Field 07B.
W73-05554

FATE AND BEHAVIOR OF FIVE CHLORINATED HYDROCARBONS IN THREE NATURAL WATERS,
Simon Fraser Univ., Burnaby (British Columbia). Dept. of Biological Sciences.
For primary bibliographic entry see Field 05B.
W73-05556

A METHOD FOR DETERMINING THE SURFACE AREAS OF STONES TO ENABLE QUANTITATIVE DENSITY ESTIMATES OF LITTORAL STONEDWELLING ORGANISMS TO BE MADE,
Leeds Univ. (England). Dept. of Zoology.
For primary bibliographic entry see Field 07B.
W73-05560

FLUORIDE, WATER HARDNESS, AND ENDEMIC GOITER,
Guy's Hospital Medical Schools, London (England).
For primary bibliographic entry see Field 05C.
W73-05563

NOTE ON THE FLAMELESS ATOMIC ABSORPTION RESPONSE OF MERCURY WITHOUT ADDED REDUCING AGENT,
Cornell Univ., Ithaca, N.Y. Pesticide Residue Lab.
W. H. Gutenmann, D. J. Lisk, and N. Grier.
Bulletin of Environmental Contamination and Toxicology, Vol 8, No 3, p 138-139, September 1972. 1 fig, 4 ref.

Descriptors: *Mercury, *Reduction (Chemical), Heavy metals, Chemical reactions.
Identifiers: *Flameless atomic absorption spectrophotometry, *Sample preparation, Atomic absorption spectrophotometry.

Results are reported on the analysis of mercury in a 1 N sulfuric acid solution by flameless atomic absorption spectrophotometry without the addition of stannous chloride as a reducing agent. It was observed that a positive AA response to mercury was obtained although it was of somewhat lower magnitude than when stannous chloride was added. Mercury response with this method required a sulfuric acid concentration of 0.1 to 6 N. A somewhat similar but lower mercury response was also noted when phosphoric acid was substituted for sulfuric. However, response was more erratic with phosphoric acid. When no reducing agent was used, a longer aeration time was required. The mechanism for this observation is discussed. (Little-Battelle)
W73-05565

UV IRRADIATION OF AROCLOR 1254,
Oregon State Univ., Corvallis. Dept. of Food Science and Technology.
J. L. Herring, E. J. Hannan, and D. D. Bills.
Bulletin of Environmental Contamination and Toxicology, Vol 8, No 3, p 153-157, September 1972. 1 fig, 7 tab, 6 ref.

Descriptors: *Degradation (Decomposition), *Polychlorinated biphenyls, *Gas chromatography, *Water analysis, *Ultraviolet radiation.
Identifiers: Sample preparation, *Aroclor 1254, Electron capture gas chromatography, Chlorinated hydrocarbons, Fate of pollutants.

Solutions of Aroclor 1254 in acetone were diluted with distilled water, hexane, and benzene and irradiated with an UV light and sunlight to study the breakdown mechanism of PCB's. Benzene and hexane samples were concentrated with a rotary evaporator. Water samples were extracted with hexane in a separatory funnel. A gas chromatograph with a tritium electron capture detector was used to follow the degradation of the first 10 peaks which represent tetra-, penta-, and hexachlorobiphenyls. In general, the PCB's degraded fastest in hexane, then water, and slowest in benzene. Some peaks increased in size suggesting that more highly chlorinated PCB's were dechlorinated to form PCB's with lower molecular weights and shorter retention times. Results with sunlight and the UV lamp agreed fairly well. Differences in degradation rates with different solvents are discussed. (Little-Battelle)
W73-05566

POLYCHLORINATED BIPHENYL RESIDUES: ACCUMULATION IN CAYUGA LAKE TROUT WITH AGE,
Cornell Univ., Ithaca, N.Y. Pesticide Residue Lab.
For primary bibliographic entry see Field 05B.
W73-05571

FINGERPRINTING OIL SLICKS.

Water and Pollution Control, Vol 110, No 9, p 31-36, September 1972. 2 tab, 2 ref.

Descriptors: *Pollutant identification, *Oil spills, Computers, Oil pollution, Ultraviolet radiation, Chemical analysis.
Identifiers: *Crude oil, *Fingerprinting, *Fluorescence spectra, *Oil characterization, Fluorescence spectrophotometry, Data interpretation.

Computer analysis of the fluorescence of oil under ultraviolet light has provided a 'fingerprinting' technique for rapid identification of oils in an oil slick. Five different types of crude oil, including Kuwait, North African, Middle Eastern and Venezuelan, have been identified based on markedly different fluorescence patterns. Detection at levels as low as ppb of oil in sea water has been accomplished. The use of a xenon instead of mercury lamp has increased accuracy of identification by production of up to 20 different wavelengths of light for examination. (Mackan-Battelle)
W73-05573

ELECTRODES FOR MAGNETIC FLOWMETERS,
C. E. T. Technical Services Station.
For primary bibliographic entry see Field 07B.
W73-05575

EFFECT OF SHELTERS ON THE RESISTANCE OF DOMINANT AND SUBMISSIVE BLUEGILLS (LEPOMIS MACROCHIRUS) TO A LETHAL CONCENTRATION OF ZINC,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Biology.
For primary bibliographic entry see Field 05C.
W73-05576

INVESTIGATION OF LAKE WATER QUALITY IN EASTERN SOUTH DAKOTA WITH REMOTE SENSING TECHNIQUES,
South Dakota State Univ., Brookings. Remote Sensing Inst.
F. A. Schmer.

Available from the National Technical Information Service as PB-215 156, $3.00 in paper copy, $0.95 in microfiche. South Dakota Water Resources Institute, Brookings, Completion Report, December 1972. 123 p, 27 fig, 15 tab, 51 ref, 6 append. OWRR B-022-SDAK (2). 14-01-001-3332.

Descriptors: *Remote sensing, Minerals, Bacteria, *Mesotrophy, *South Dakota, Lakes, *Dissolved solids, Sulfates, Sodium, Cations.
Identifiers: *Senescent lakes, Photobacteria, Pelagic production, *Mesotrophic lakes.

The study area is located on the western flank of the Coteau des Prairie in Codington County, South Dakota. The lakes within the study area are all natural lakes of glacial origin, which were formed during the Wisconsin glaciation period. Photographic and thermal remote sensing imagery aided in the interpretation of chemical, geological, and biological features and events, but water quality-imagery correlations were largely unsuccessful. The majority of the lakes may be considered magnesium sulfate lakes with sodium becoming the more dominant cation in the more senescent lakes. Poor aquifer flushing, characteristic of closed drainage systems, resulted in an accumulation of total dissolved solids in the ground water. The ground water averaged 2153 mg/liter total dissolved solids with an accumulation of sulfate which averaged 40% of the total dissolved solids by weight. With the exception of Grass Lake, the study lakes all occupy closed depressions with little or no ground-water movement between, and exist in various stages of senescence depending upon local climatic and edaphic conditions. All lakes except Grass Lake are also similar in chemical composition with sulfate again the dominant ion averaging between 63% and 70% by weight of the dissolved solids. Evaporation appears to be the principal cause of water loss and consequent mineralization. (Wiersma-South Dakota State)
W73-05580

MERCURY LEVELS IN MUSCLE TISSUES OF PRESERVED MUSEUM FISH,
Michigan Dept. of Natural Resources, Lansing. Fish Div.
R. J. Evans, J. D. Bails, and F. M. D'Itri.
Environmental Science and Technology, Vol 6, No 10, p 901-905, October 1972. 3 fig, 1 tab, 13 ref.

Descriptors: *Fish, *Mercury, *Absorption, Heavy metals, *Lake Erie, Bass, Sunfishes, Freshwater fish, Perches, Sauger, Walleye, Rock bass, White bass, Smelts, Yellow perch, Suckers, Drums, Carp, Catfishes, Bullheads, Lampreys, Pikes, Buffalo fish, Channel catfish, Path of pollutants, Water pollution effects, Water pollution sources.
Identifiers: *Biological samples, *Atomic absorption spectrophotometry, *Museum specimens, *Sample preparation, Tissue, Muskellunge, Sea lamprey, Lake sturgeon, Lake St. Clair, Northern pike, Smallmouth bass, White crappie, Longnose gar, Black bullhead, Quillback, Gizzard shad, Goldfish, Bigmouth buffalo, Silver redhorse, Rainbow smelt, Yellow bullhead, Esox masquinongy, Petromyzon marinus, Acipenser fulvescens.

Flameless atomic absorption spectrophotometry was used to establish the total mercury levels in 57 preserved fish specimens of various species collected in the Lake St. Clair-Western Lake Erie region of the Great Lakes between the years of 1920-65. Only five fish were found to contain mercury levels in excess of 0.5 ppm-three large muskellunge collected in Lake St. Clair in 1939 (2.38, 1.57, and 1.58 ppm) and two adult sea lampreys collected in the Clinton River tributary to Lake St. Clair in 1938 (0.90 and 1.29 ppm). A trend was established relating the mercury content of selected categories of fishes with the year and location of collection for the fish specimens. The 1970-71 mercury levels in fish from the two study areas were found to average more than those preserved museum specimens in the same categories taken from the same area. (Little-Battelle)

W73-05585

DIRECT OBSERVATIONS ON THE SUBLITTORAL MARINE ALGAE OF ARGYLL, SCOTLAND,
Glasgow Univ. (Scotland). Dept. of Botany.
T. A. Norton, and J. A. Milburn.
Hydrobiologia, Vol 40, No 1, p 55-68, August 31, 1972. 5 fig, 1 tab, 13 ref.

Descriptors: *Marine algae, *Phaeophyta, *Chlorophyta, *Rhodophyta, Sessile algae, Marine plants, Littoral.
Identifiers: *Sublittoral, Scotland, Epiphytes, Epilithic, Laminaria hyperborea, Laminaria saccharina, Ophiocomina nigra, Substrates, Cladophora rupestris, Ulva lactuca, Desmarestia viridis, Ectocarpus siliculosus, Callophyllis laciniata, Ceramium rubrum, Cryptoplaura ramosa, Phycodrys rubens, Plocamium cartilagineum, Desmarestia aculeata, Dictyota dichotoma, Laminaria digitata, Chondrus crispus, Delesseria sanguinea.

Diving surveys were made off Argyll, on the west coast of Scotland, June 1966 - May 1968, in order to obtain a general qualitative description of the major components of the flora as related to depth. Divers collected algae from 3-m depth zones at 11 sites, some of which were exposed to the full force of the Atlantic while others were extremely sheltered. More than half of the algal species found were confined to the sublittoral zone. The greatest variety of species was found in shallow water at sites sheltered from excessive turbulence. With increasing depth the number of species found steadily decreased. There was no evidence of a specifically distinct algal flora confined to deeper water. No algae were found deeper than 36 m below ELWS at any site, but the lower limit of algal growth was reduced to 9 m in a turbid water loch and to 3 m at a site where the herbivorous echinoderm Ophiocomina nigra was abundant. Fairly distinct algal communities were found on different substrates. The major communities recognized underwater were algae attached to stable substrata, algae, especially on the stipes of Laminaria hyperborea. On stable rock in areas subject to water movement L. hyperborea forest was the dominant vegetation whereas on unstable substrata and in sheltered localities L. saccharina was dominant. (Holoman-Battelle)
W73-05586

MICROBIOLOGICAL PATHOGENS IN ANIMALS AND THEIR DETECTION,
Environmental Protection Agency, Cincinnati, Ohio.
D. J. Reasoner.
Journal Water Pollution Control Federation, Vol 44, No 6, p 1182-1193, June 1972. 98 ref.

Descriptors: *Pathogenic bacteria, *Reviews, *Animal diseases, *Pollutant identification, *Animal pathology, *Isolation, *Water pollution sources, *Animal wastes (Wildlife), *Small animals (Mammals), *Microbiology, Enteric bacteria, Marine animals, Soil bacteria, Aquatic bacteria, Coliforms, E. coli, Salmonella, Poultry, Cattle, Hogs, Sheep, Birds, Reptiles, Snakes, Turtles, Rodents, Shigella, Pseudomonas, Aerobic bacteria, Mycobacterium.
Identifiers: Serotypes, Feces, Fecal coliforms, Selective media, Culture media, Immunofluorescence techniques, Enrichment, Differential media, Salmonella spp., Arizona, Lizards, Ameiva, Cnemidophorus, Leptospira spp., Sea lions, Zalophus californianus californianus, Rattus norvegicus, Rattus flavipectus, Proteins, Providencia, Serratia, Citrobacter frnendic, Lake Mendota, Vibrio parahemolyticus, Vibrio comma, Mycobacterium balnei, Mycobacterium marinum, Chromobacterium violaceum, Enterobacteriaceae, Periplaneta americana.

The occurrence and the pathogenicity of microbes are reviewed in reference to humans and other animals. The sources of the pathogenic organisms include contaminated water via feces and contaminated food sources - cattle, sheep, poultry, animal feeds. Methods for detecting bacterial pathogens are also reviewed. (Holoman-Battelle)
W73-05587

A MOBILE LABORATORY FOR FOOD PROCESSING WASTEWATER ANALYSES,
Oregon State Univ., Corvallis. Dept. of Food Science and Technology.
M. R. Soderquist, and D. W. Taylor.
Water and Sewage Works, Vol 119, No 8, p R-85/R-89, August 1972. 2 fig, 8 ref.

Descriptors: *Laboratory tests, Laboratory equipment, *Analytical techniques, *Design criteria, *Monitoring, Sampling, Waste water, Sewage, Treatment facilities, Chemical oxygen demand, Biochemical oxygen demand, *Food processing industry.

Effluents from food processing plants are being monitored by a mobile analytical facility. Existing knowledge of volumes and characteristics of food processing wastewaters is being augmented by the data generated. In addition to a cost analysis, design criteria for the unit are included. (Smith-Texas)
W73-05641

SUSPENDED SOLIDS DETERMINATION USING A FILTER PHOTOMETER,
Hach Chemical Co., Ames, Iowa.
H. R. Tool.
Water and Sewage Works, Vol 119, No 8, p R-130/R-131, August 1972. 2 fig, 1 tab, 3 ref.

Descriptors: *Suspended solids, *Spectrophotometry, *Sewage, *Water quality control, *Sampling, Waste water, Water quality, Colorimetry, Color, Analytical techniques, Chemical analysis.
Identifiers: *Transmittance.

The transmittance of a sewage sample was measured by a spectrophotometer after the sample had been blended to produce particles of a consistent size. Comparison of the standard Gooch method with this spectrophotometric method showed a linear relationship between mg/l of SS and transmittance. This procedure requires less than five minutes compared to over an hour for other methods. (Smith-Texas)
W73-05646

CHROMATOGRAPHY OF METAL CHELATES. III. SEPARATION OF DISUBSTITUTED DITHIOCARBAMATES BY THIN-LAYER CHROMATOGRAPHY, (CHROMATOGRAPHIE VON METALLCHELATEN. III. DUNNSCHICHT-CHROMATOGRAPHISCHE TRENNUNG DI-SUBSTITUIERTER DITHIOCAR BAMATE),
Mainz Univ. (West Germany). Institut fuer Anorganische Chemie und Kernchemie.
K. Konig, J. Becker, W. Henke, J. Stenshorn, and H. Werner.
Zeitschrift fur Analytische Chemie, Vol 259, No 1, p 11-16, 1972. 5 fig, 3 tab, 32 ref.

Descriptors: *Separation techniques, Pollutant identification, *Chelation, Solvent extractions, Methodology, Chemical analysis, Lead, Zinc, Copper, Heavy metals.
Identifiers: *Metal chelates, *Dithiocarbamates, *Thin layer chromatography, Dimethyl dithiocarbamate, Dicyclohexyl dithiocarbamate, Dibenzyl dithiocarbamate, Diethoxyethyl dithiocarbamate.

The effects of substitution on the separation by thin-layer chromatography of metal dithiocarbamates (DTC) have been studied. With increasing size of the alkyl substituents - ranging from dimethyl to di-cyclohexyl and di-benzyl - the differences in the R sub f-values of the metal chelates decrease, though separations are still possible. The sharp differences in the R sub f-values of the Cu- and Zn-dicyclohexyl-DTC on silica gel and alumina point out that the interaction between solid phase and chelate is still governed by the central metal atom even when bulky alkyl substituents are present. Tailing effects as particularly observed for Pb- and Zn-DTS on alumina are greatly diminished with di-cyclo- and di-benzyl-DTC proving these reagents to be favorable for separations by liquid chromatography. Ether functions as substituents in dithiocarbamates tend to decrease solvent extractability of the metal-DTC. However, the di-ethoxyethyl-DTC are easily extracted and give separations superior to the di-ethyl-DTC taken as standard reagent. (Holoman-Battelle)
W73-05666

INVESTIGATIONS ON THE MATRIX EFFECT IN THE ATOMIC ABSORPTION SPECTROSCOPY OF IRON, COBALT AND NICKEL, (UNTERSUCHUNGEN ZUM MATRIXEFFEKT BEI DER ATOMABSORPTION AM BEISPIEL EISEN, KOBALT, NICKEL),
Muenster Univ. (West Germany). Anorganisch-Chemisches Institut.
For primary bibliographic entry see Field 05C.
W73-05667

THE CELL WALL ULTRASTRUCTURE AS A TAXONOMIC CHARACTERISTIC OF THE GENUS SCENEDESMUS. 2. TAXONOMIC EVALUATION OF THE INVESTIGATED SPECIES, (DIE ZELLWANDULTRASTRUKTUR ALS TAXONOMISCHES MERKMAL IN DER GATTUNG SCENEDESMUS. 2. TAXONOMISCHE AUSWERTUNG DER UNTERSUCHTEN ARTEN),
Ceskoslovenska Akademie Ved, Trebon. Inst. of Microbiology.
V. J. Komarek, and J. Ludvik.
Archiv fur Hydrobiologie, Supplement, Vol 41, No 1, p 11-47, May 1972. 26 fig, 1 tab, 22 ref.

Descriptors: *Systematics, *Scenedesmus, *Plant morphology, *Pollutant identification, Electron microscopy, Aquatic algae, Phytoplankton, Cultures, Microscopy, Algae.
Identifiers: *Cell wall, *Ultrastructure, Scenedesmus dimorphus, Scenedesmus longus, Scenedesmus opoliensis, Scenedesmus spinosus, Scenedesmus abudans, Scenedesmus subspicatus, Scedemus helveticus, Scenedesmus spinosus, Scenedesmus gutwinskii.

The cell wall ultrastructure was studied of 13 species (26 strains) of the genus Scenedesmus. On the basis of the ultrastructural features their specific characteristics were completed. The determination of different species was made according to protologe, from which the original picture and diagnosis represented the main components. For the further taxonomical studies of the genus Scenedesmus the cultivation of all new described or revised species is considered necessary. The cultivation method enables also the ultrastructure studies. (Holoman-Battelle)
W73-05668

THE ULTRASTRUCTURE OF THE FRUSTULES OF SOME ENDEMIC SPECIES OF DIATOMS OF YUGOSLAVIA, (L'ULTRASTRUCTURE DES FRUSTULES DE QUELQUES ESPECES ENDEMIQUES DES DIATOMEES DE LA YOUGOSLAVIE),
Sarajevo Univ. (Yugoslavia). Faculty of Natural Science.
P. L. Jerkovic.
Archiv fur Hydrobiologie, Supplement, Vol 41, No 1, p 1-10, May 1972. 32 fig, 12 ref.

Descriptors: *Diatoms, *Plant morphology, Chrysophyta, Aquatic algae.
Identifiers: *Ultrastructure, *Lake Ohrid, *Scanning electron microscopy, *Yugoslavia, Surirella biseriata, Iconella variabilis, Plagiodiscus glaber, Plagiodiscus costatus, Campylodiscus pervulsus, Campylodiscus marginatus var. tenuis, Campylodiscus striatus.

A description of the surface ultrastructure of frustules in 7 species of diatoms from the Lake Ohrid, studied by scanning electron microscope, is presented. Six of these species are endemic and relict in this lake. The frustules consist of nannofibrilles and aiguillettes. (Holoman-Battelle)
W73-05669

SOURCES OF ERROR AND THEIR ELIMINATION IN THE DETERMINATION OF LEAD IN BIOLOGICAL SUBSTANCES BY MEANS OF DITHIZONE, (FEHLERMOGLICHKEITEN UND DEREN ELIMINIERUNG BEI DER BESTIMMUNG VON BLEI MITTELS DITHIZON IN BIOLOGISCHEN SUBSTANZEN),
Hohenheim Univ., Stuttgart-Hohenheim (West Germany).
W. Oelschlager, and E. Schwarz.
Zeitschrift fur Analytische Chemie, Vol 258, No 3, p 203-207, February 8, 1972. 5 tab, 15 ref.

Descriptors: *Lead, *Pollutant identification, *Chemical analysis, Heavy metals, Separation techniques, Organic compounds, Solvent extractions, Methodology.
Identifiers: *Error sources, *Dithizone, *Biological materials, Chemical interference, Bismuth, Diethylammonium-N N'-diethyldithiocarbamate, Organic solvents, Ashing.

The most serious interference is caused by bismuth. A method for the determination of bismuth is given and results are presented for investigations of the Bi and Pb contents of biological and other materials from within and outside emission areas. Normally, a separation of Bi is not required, except in the case of samples taken from the vicinity of factories processing sulphidic ores. The best and quickest method of separation is that using diethylammonium-N, N'-diethyldithiocarbamate. For the determination of lead it should be taken into account that the reagents sodium and ammonium citrate and also hydrofluoric acid are contaminated with relatively high amounts of lead. Pure chloroform is used as blank solution as the extracted blank solution is not stable even in darkness. Sources of error in ashing are also discussed and a method is described which can be carried out rapidly and is well reproducible. (Holoman-Battelle)
W73-05671

WATER-QUALITY DATA FOR THE FLAMING GORGE RESERVOIR AREA, UTAH AND WYOMING, 1969-72,
Geological Survey, Salt Lake City, Utah.
For primary bibliographic entry see Field 07C.
W73-05693

CONDUCTIVITY MEASUREMENTS MONITOR WASTE STREAMS,
Tennessee Valley Authority, Muscle Shoals, Ala.
P. A. Corrigan, V. E. Lyons, G. D. Barnes, and F. G. Hall.
Environmental Science and Technology, Vol 4, No 2, p 116-121, February 1970. 4 fig, 1 tab.

Descriptors: Water pollution control, *Electrical conductance, *Stream gages, Water quality, Pollution abatement, Pollutant identification, Indicators, Water pollution sources, *Pollutant identification, Path of pollutants.
Identifiers: Chemical spills, Pollution detection.

Electrical conductivity measurement is a simple and fast method for determining the relative amount of ions in water. This method is now being used to detect the presence of pollutants in industrial effluents. Using recorders, it is possible to determine concentrations and duration of waste dumpings. Investigation into the proper choice and location of the devices was carried out. Guidelines for proper installation and maintenance are presented. The cells and recorders should be checked and cleaned daily if possible. The systems proved to be very effective in detecting and reporting levels of pollution. The savings in lost chemicals soon paid for the equipment. (Skogerboe-Colorado State)
W73-05739

NEW RADIOTRACER TECHIQUE INVOLVING 14C AND 51CR, FOR ESTIMATING THE ASSIMILATION EFFICIENCIES OF AQUATIC, PRIMARY CONSUMERS,
Leeds Univ. (England). Dept. of Zoology.
P. Calow, and C. R. Fletcher.
Oecologic (Berl). Vol 9, No 2, p 155-170. 1972. Illus.
Identifiers: *Algae, Aquatic animals, Bacteria, *Carbon-14, Chromium-51, Feces, Food, Gastropod, *Radio tracer techniques, Tracers.

Gavimetric, radiotracer, and indicator methods currently available for estimating assimilation efficiencies, are reviewed and their associated limitations are discussed. It was concluded that the basic assumption implicit to gravimetric and indicator techniques, i.e., that all material contained within the feces is derived from the food, does not generally hold. Radiotracer techniques are not based on this assumption but are time consuming. Consequently a new radiotracer technique analogous to indicator methods has been developed. In this technique the concentration of a non-absorbed indicator is expressed in terms of a radiotracer, 14C, which can be absorbed by which, at least initially, is only present in the food, rather than expressing it in terms of dry weight. 51Cr has been used as the non-absorbed indicator. Use of these 2 isotopes in conjunction not only enables a distinction to be made between fecal material derived from food, and that derived from metabolic secretions but also facilitates estimation of assimilation efficiencies from small samples of feces only. The new technique requires measurement of the ratio 14C:51Cr in samples of both food and faces. The applicability of conditions necessary for operation of the new technique has been tested on 2 spp. of freshwater gastropod, one feeding on epilithic algae, the other on bacteria, and its effectiveness has been tested by reference to results obtained from another, more conventional method involving 14C only.–Copyright 1972, Biological Abstracts, Inc.
W73-05766

CHEMICAL COMPOSITION OF DEEP FORMATION WATERS IN SOUTHWESTERN LOUISIANA,
Tulsa Univ., Okla.
For primary bibliographic entry see Field 02K.
W73-05821

PROBLEMS IN LEAD MINING WASTE CONTROL,
Missouri Univ., Rolla.
For primary bibliographic entry see Field 05G.
W73-05822

NITRATE CONCENTRATIONS IN GROUNDWATER BENEATH A BEEF CATTLE FEEDLOT,
Agricultural Research Service, Gunnison, Colo. Soil and Water Conservation Research Div.
For primary bibliographic entry see Field 05B.
W73-05823

INSTRUMENTAL SURVEILLANCE OF WATER QUALITY, A REVIEW OF THE ROLE OF ANALYTICAL INSTRUMENTATION,
Beckman Instruments, Inc., Fullerton, Calif.
J. A. Miller, C. W. Keller, and W. F. Ulrich.
Industrial Technical Report TR-571, 1972. 37 p, 72 fig, append.

Descriptors: *Pollutant identification, *Water quality, Monitoring, *Water analysis, Spectroscopy, Nuclear engineering, Absorption, Gas chromatography, Infrared radiation, Biochemical oxygen demand, Spectroscopy, Chromatography, *Instrumentation.
Identifiers: PH measurement, Stomic absorption, Nuclear techniques, Raman spectroscopy.

Analytical instrumentation, which plays an important role in the surveillance of water quality, is explored. Most of the important types of water quality analyses being performed are discussed, ranging from simple tests for physical parameters to sophisticated radiological and spectrophotometric methods. The required instrumentation is described, and example analyses illustrate specific water quality applications. The important contribution made by analytical instrumentation in the area of water resources is graphically illustrated. Included are oxygen measurements, biochemical oxygen demand, pH measurement, atomic absorption, nuclear techniques, ultraviolet spectroscopy, infrared spectroscopy, and gas chromatography. (Campbell-NWWA)
W73-05824

ANALYSIS OF INSECT TROPHIC DIVERSITY IN TWO SALT MARSH COMMUNITIES,
California Univ., Davis. Dept. of Zoology.
G. N. Cameron.
Ecology, Vol. 53, No. 1, p 58-73, Winter 1972. 8 fig, 2 tab, 57 ref.

Descriptors: *Insects, *Trophic level, *Salt marshes, *Food habits, *Tidal marshes, *Biological communities, Primary productivity, Biomass, Predation, Bioindicators, Intertidal areas, Herbivores, Standing crops, Systematics, Secondary productivity, Saline water, Sampling, Equations, Diptera, Animal populations, Environmental effects.
Identifiers: *Species diversity, Saprovores, Salicornia pacifica, Spartina foliosa, Seasonal variations, Macrophytes, Coleoptera, Hymenoptera, Homoptera, Thysanoptera, Hemiptera, Lepidoptera, Collembola, Psocoptera, Neiroptera, Thysanura.

This study analyzes trophic relationships of the insect component of two intertidal salt marsh communities dominated by Salicornia pacifica and Spartina foliosa, respectively. Seasonality of that component is determined and influence of physical microenvironmental factors on trophic diversity is assessed. Adult insect populations were monitored weekly, trophic diversity was computed, and relationships with primary production and litter accumulation were quantified. Temporal diversity trends were similar in both communities although the amplitude was slightly greater in Salicornia. In both communities, hervibore dieversity was highest during the spring months while saprovore diversity was highest during midwinter. Predator diversity responded to both herbivore and saprovore diversity, although it was more closely tied to herbivore fluctuations in Salicornia. Standing crop biomass was maximum during October and litter accumulation was highest during January. Two classes of adult insects occurred: persistent species, representing a low percentage of the total species compliment, were present as adults throughout the year in both marsh communities; seasonal species, on the other hand, were present as adults only during the growing season. Seasonal succession in species of herbivores and saprovores reflected productional and transformational changes in plant matter; predators

responded likewise, but more impressive was the numerical response to prey populations by particular predators. Correlations were high between each trophic group and its respective resource. Physical microenvironmental factors, especially temperature and vapor pressure deficit, seemed to be important in duing larval development, but did not exert a dramatic effect on adult diversity trends. Several strategies of habitat utilization are considered. (Byrd-Battelle)
W73-05834

SOME PROBLEMS OF MARINE TOXICITY STUDIES,
University of Strathclyde, Garelochhead (Scotland), Marine Lab.
For primary bibliographic entry see Field 05C.
W73-05835

PATTERNS OF SPECIES DIVERSITY IN CARIBBEAN REEF CORALS,
Yale Univ., New Haven, Conn. Dept. of Biology.
J. W. Porter.
Ecology, Vol. 53, No. 4, p 745-748, Summer 1972. 4 fig, 19 ref.

Descriptors: *Coral, *Reefs, Surveys, Biomass, Depth, Bioindicators, Pollutant identification, Equations.
Identifiers: *Species diversity, *Caribbean Sea, Montastrea annularis, Acropora palmata, Acropora cervicornis, San Blas Islands.

A method of counting chain links covering living coral is described and discussed as a means of calculating species diversity on coral reefs. Species diversity on San Blas coral reefs, Atlantic coast, Panama, shows two trends: diversity (H') increases from the surface to a peak of 3.2 at 5 m, remains between 1.5 and 3.5 down to 25 m, and then falls off to 0.0. Superimposed on this trend is an increase in diversity toward cliff edges. The cliff-edge diversity values are always higher than their corresponding back shelf values; this difference is significant at the 0.05 level for all but one of the ledges measured. In addition, the average cliff edge diversity (H' equals 2.28) is significantly higher (P less than 0.05) than the average back shelf diversity (H' equals 1.89). Species diversity correlates strongly (P less than 0.001) with both components of the species diversity formulation, species number and species evenness, indicating that both of these components are simultaneous properties of this coral reef community. Since the San Blas reefs are constructional, not erosional, in form and since corals have been shown to interact in definite competitive ways, the observed organization is under a considerable amount of biological control and the consistent, statistically significant diversity trends are indicative of an active form of coral community organization. (Byrd - Battelle)
W73-05837

SEASONAL IONIC FLUCTUATIONS IN A COMMUNITY,
Carleton Univ., Ottawa (Ontario). Dept. of Biology.
L. L. Bayly, and T. A. O'Neill.
Ecology, Vol. 53, No. 4, p 714-719, Summer 1972. 8 fig, 12 ref.

Descriptors: *Ions, *Seasonal, *Fluctuations, *Chemical analysis, *Plant tissues, *Soil analysis, Path of pollutants, Amphibious plants, Cattails, Calcium, Magnesium, Potassium, Sodium, Iron, Phosphorus, Leaves, Moisture content, Aging (Biological), Rhizomes, Plant physiology, Sampling, Spectrophotometry, Colorimetry, Rooted aquatic plants, Alkali metals, Alkaline earth metals, Heavy metals.
Identifiers: *Typha glauca, Chemical composition.

Calcium, magnesium, potassium, sodium, iron, and phosphorus concentrations were measured in rhizomes, leaves, and flora stalks of a Typha glauca community during the growth season of 1968. Leaf-length and plant-organ moisture contents were also determined using standard methods and used as indicators of physiological aging. Representative plant and soil samples were collected twice weekly throughout the 5-month growing season in 1968. Calcium, magnesium, potassium, sodium, and iron concentrations of the soil and plant material were determined by spectrophotometry and phosphorus content by colorimetry. Seasonal fluctuation was found in all ions examined in the soil and all plant parts analyzed. The ions studied were grouped into three categories with reference to apparent seasonal fluctuations of ionic concentrations. Concentration changes of calcium and possibly magnesium in plant tissue were inversely related to apparent changes in substrate concentration. Changes in concentration of potassium and phosphorus in floral stalks and leaves were inversely related to apparent changes in ion concentration in the rhizome, although not related to changes in the substrates. Changes in concentration of sodium and iron in all plant parts sampled were directly related, but no relationship was detected between the apparent changes in concentration in plant tissue and those in the substrates. (Byrd - Battelle)
W73-05838

A STUDY OF STRONTIUM, MAGNESIUM, AND CALCIUM IN THE ENVIRONMENT AND EXOSKELETON OF DECAPOD CRUSTACEANS, WITH SPECIAL REFERENCE TO UCA BURGERSI ON BARBUDA, WEST INDIES,
Marine Biological Association of the United Kingdom, Plymouth (England).
For primary bibliographic entry see Field 05B.
W73-05841

PREDICTING GAS-CHROMATOGRAPHIC RESOLUTION FOR PAIRS OF N-ALKANE HOMOLOGS,
Purdue Univ., Lafayette, Ind. Dept. of Chemistry.
R. S. Swingle, and L. B. Rogers.
Analytical Chemistry, Vol 44, No 8, p 1415-1421, July 1972. 7 fig, 5 tab, 25 ref.

Descriptors: *Gas chromatography, Analytical techniques, Chromatography, Organic compounds.
Identifiers: *Resolution, *N-alkanes, *Retention time, Homologs, Paraffins.

Using values for relative retention, number of theoretical plates, and relative peak widths determined for two members of a homologous series, reasonably good predictions can be made for resolutions at a given value of capacity ratio for other pairs of homologs in a relatively well behaved chromatographic system. The limitations of the assumptions, upon which some of the calculations were based, have been examined using as an example the n-alkanes on SE-30. (Little-Battelle)
W73-05847

USE OF INDUCTION FURNACE SOURCE FOR SPECTROMETRIC DETERMINATION OF IODINE,
Cornell Univ., Ithaca, N.Y. Dept. of Chemistry.
Y. Talmi, and G. H. Morrison.
Analytical Chemistry, Vol 44, No 8, p 1467-1469, July 1972. 2 fig, 2 tab, 12 ref.

Descriptors: *Iodine, Analytical techniques, Spectroscopy, Laboratory equipment, Calibrations.
Identifiers: *Biological samples, *Sample preparation, *Induction furnace, *Precision, *Emission spectroscopy, Thyroid, Liver, Calibration curves.

Samples of freeze-dried pork thyroid and freeze-dried beef liver were prepared for spectrometric analysis of iodine by doping with standard solutions of NH4I, NaI, and KI. The purpose of the analyses was to evaluate the RF induction furnace (RFF) source of atomic emission studies and to establish optimum operating parameters. The study was divided into two parts. The first consisted of obtaining and comparing emission intensities from various organic and inorganic iodine compounds to provide a basis for evaluating RFF applicability. The second study was concerned with the feasibility of applying the RFF technique to analysis of iodine in very complex matrices such as the thyroid samples. Statistical examination of the iodine working curves of all the inorganic and organic compounds studied indicate that they are identical with regard to shape, intercept, and correlation coefficient of the line, at 95 percent confidence level. The only exception was the liver doped with iodine. These working curves indicate that spectral interferences were caused by the liver tissue and caused suppression of iodine emission intensity. Similar results were obtained with the thyroid samples. Little-Battelle)
W73-05848

SEPARATION OF CADMIUM (II) FROM ZINC (II) AND OTHER METAL IONS ON A CADMIUM SELECTIVE EXCHANGER: TITANIUM SELENITE,
Aligarh Muslim Univ. (India). Dept. of Chemistry.
M. Qureshi, R. Kumar, and H. S. Rathore.
Analytical Chemistry, Vol 44, No 6, p 1081-1084, May 1972. 2 fig, 2 tab, 23 ref.

Descriptors: *Separation techniques, *Cadmium, *Ions, *Zinc, *Ion exchange, Aqueous solutions, Heavy metals, Hydrogen ion concentration, Filtration, Drying, Sieves, Volumetric analysis, Gravimetric analysis, Spectrophotometry, X-ray analysis, Pollutant identification, Selectivity, Chemical analysis, Titanium, Filters.
Identifiers: *Titanium selenite, Infrared analysis, Sample preparation.

A simple and rapid method is presented for the separation of cadmium from zinc and from numerous other metal ions by the use of a titanium selenite column. The exchanger is prepared by mixing titanic chloride and sodium selenite solutions, followed by washing, filtering, drying, converting to hydrogen form, seiving, washing again, and finally drying the precipitates at 50C. The values determined for the distribution coefficient of metal ions on titanium selenite, the saturation ion-exchange capacity for potassium, the pH-titration curves, X-ray and IR studies were accomplished by standard methods. A glass column with glass wool support is filled with titanium selenite for separation studies. After the exchanger is dissolved in hydrochloric acid, selenium is separated by sulfur dioxide treatment and determined gravimetrically, while titanium is determined volumetrically in the filtrate. The breakdown of the exchanger in solution is followed by determining the titanium and selenium content in the solution spectrophotometrically. Titanium selenite is more selective for the separation of cadmium from numerous metals than other exchangers based on titanium, probably due to the formation of a complex anion, cadmium tetrachloride, with ammonium chloride. (Byrd-Battelle)
W73-05849

CONCENTRATION AND ESTIMATION OF 14 POLYCYCLIC AROMATIC HYDROCARBONS AT LOW LEVELS IN HIGH-PROTEIN FOODS, OILS, AND FATS,
G. Grimmer, and A. Hildebrandt.
Journal of the Association of Official Analytical Chemists, Vol 55, No 3, p 631-635, May 1972. 3 fig, 4 tab, 12 ref.

Descriptors: *Lipids, *Proteins, *Oil, *Foods, Fish, Poultry, Yeasts, Filtration, Pollutant

identification, Chemical analysis, Methodology, Aqueous solutions, Silica gels.
Identifiers: *Polycyclic hydrocarbons, *Aromatic hydrocarbons, Saponification, Ultraviolet spectrophotometry, Chemical recovery, Cleanup, Sample preparation, Thin layer chromatography, Phenanthrene, Anthracene, Pyrene, Fluoranthene, Chrysene, Benzo (a)anthracene, Benzo (a)pyrene, Benzo (c)pyrene, Benzo (k)fluoranthene, Perylene, Anthanthrene, Benzo (g-h-i)perylene, Dibenz (a-h)anthracene, Coronene.

Fourteen polycyclic hydrocarbons in (I) meat, poultry, fish, and yeast, and (II) fats and oils have been isolated and determined. To separate group I homogeneously, 2N methanolic KOH is used. In the first step of concentration (methanol-water-cyclohexane) partition (1 plus 1 plus 5), a 200 g sample is reduced to 0.2 g of polycyclic fraction without any emulsions. The same effective concentration is found for group II without a saponification step by partition in N,N-dimethylformamide-water-cyclohexane (9 plus 1 plus 10). Further very effective concentration (100:1) of polycyclics results from filtration on Sephadex LH 20 (solvent:isopropanol). After further cleanup by filtration on silica gel, phenanthrene, anthracene, pyrene, fluoranthene, chrysene, benzo (a)anthracene, benzo (a)pyrene, benzo (c)pyrene, benzo (k)fluoranthene, perylene, anthanthrene, benzo (g,h,i)perylene, dibenz (a,h)-anthracene, and coronene are separated on an aluminum oxide column or equivalent. Groups I and II are analyzed by spectrophotometry, thin-layer chromatography and/or ultraviolet spectroscopy. Recoveries ranged from 75 to 92 percent for all polycyclics down to the 2 ppb level. (Byrd-Battelle)
W73-05850

5B. Sources of Pollution

MICROBIOLOGICAL FORMATION OF POTENTIALLY HAZARDOUS ORGANO--METAL COMPOUNDS IN WATER,
Cornell Univ., Ithaca, N.Y. Water Resources and Marine Sciences Center.
M. Alexander.
Available from the National Technical Information Service as PB-214 698, $3.00 in paper copy, $0.95 in microfiche. Water Resources and Marine Sciences Center Technical Report No. 47, 1972. 17 p, 4 tab. OWRR A-037-NY (1). 14-31-0001-3532.

Descriptors: *Arsenic compounds, *Fungi, *Metal organic pesticides, Selenide compounds, Tellurium compounds, Water pollution sources.
Identifiers: *Candida, *Gilocladium, *Penicillium.

Species of Candida, Giliocladium and Penicillium from polluted waters were found to produce trimethylarsine gas from several arsenic sources. The pH of the solution and phosphate ions had a marked effect on the biosynthesis of this volatile arsenic compound. A strain of Penicillium which produced dimethylselenide from inorganic selenium compounds was isolated from raw sewage. Sulfate and methionine enhanced growth of the fungus and its production of dimethylselenide in media containing selenite. In solutions containing selenate, methionine inhibited dimethylselenide formation while stimulating proliferation of the fungus. Dimethylselenide was also generated from inorganic selenide. Alkylation did not appear to be a significant mechanism of selenium detoxication by this organism. Dimethyltelluride was also produced by the organism from several tellurium compounds, but this product was synthesized only in the presence of both tellurium and selenium. The yields of dimethylselenide and dimethyltelluride varied with the relative concentrations of selenium and tellurium in the medium.
W73-05206

PROJECTS OF THE MUNICIPAL TECHNOLOGY BRANCH THROUGH JUNE 1972,
Environmental Protection Agency, Washington, D.C. Office of Research and Monitoring.
For primary bibliographic entry see Field 05D.
W73-05212

UNDERGROUND COAL MINING METHODS TO ABATE WATER POLLUTION: A STATE OF THE ART LITERATURE REVIEW.
West Virginia Univ., Morgantown. Coal Research Bureau.

Copy available from GPO Sup Doc as EP1.16:14010 FKK 12/70, $0.60; microfiche from NTIS as PB-214 697, $0.95. Environmental Protection Agency Water Pollution Control Research Series, December, 1970. 50 p., 16 fig, 67 ref. EPA Program 14010 FKK 12/70.

Descriptors: *Acid mine water, *Grouting, *Hydrogeology, *Groundwater barriers, *Water management, Groundwater movement, Coal mines, Pollution abatement, Water pollution control, Water table, Land management, *Reviews.
Identifiers: *Inert gases, Silica gel.

This is a review of published information pertaining to the abatement of harmful drainage from underground coal mines. New aspects of two different approaches were considered. Some new physical approaches to the problem of interdicting water entry into coal mines are: (a) land management for surface and sub-surface water diversion, (b) the exploitation of water carrying strata, and (c) new mining methods. Also, chemical approaches to abatement include: (a) the use of silica gel solutions underground to prevent acid formation, (b) the use of inert gas in active mines and (c) the use of new and the refinement of known grouting agents. (Smith-Texas)
W73-05215

PILOT SCALE STUDY OF ACID MINE DRAINAGE.
Ohio State Univ. Research Foundation, Columbus.

Copy available from GPO Sup Doc as EP1.16:14010 EXA 03/71, $1.00; microfiche from NTIS as PB-214 771, $0.95. Environmental Protection Agency Water Pollution Control Research Series Report No. 14010 EXA, March 1971. 84 p., 23 fig, 14 tab., 7 ref., 1 append.

Descriptors: *Acid mine water, *Coal mines, *Pollution abatement, *Sulfides, *Pyrites, Ohio, Water pollution, Water pollution sources, Environmental control, Research facilities, Industrial wastes.
Identifiers: *Auger holes, *McDaniels mine, Underground mines.

In order to study pyrite oxidation and resulting acid mine drainage, a research facility was developed using a small, long-abandoned drift mine (McDaniels mine) and six 33 inch diameter auger holes drilled in order to have comparable, isolated, experimental 'mines' on a pilot scale basis. Experimental data and observations of the effect of oxygen concentration on acid production have shown the location of major reaction zones and indicated that bacterial catalysis of pyrite oxidation is not a significant factor in production of acid mine drainage. When the correspondence between holes has been extablished, one hole will be used as a reference mine so that fluctuations due to hydrologic variations can be separated from effects of experimentally imposed changes in the other holes. (Smith-Texas)
W73-05216

OCEAN DUMPING OF WASTE MATERIALS.
For primary bibliographic entry see Field 05E.
W73-05225

OCEAN DISPOSAL OF UNSERVICEABLE CHEMICAL MUNITIONS.
For primary bibliographic entry see Field 05E.
W73-05226

TRITIUM SURVEILLANCE SYSTEM, JANUARY-MARCH 1972.
Environmental Protection Agency, Washington, D.C. Office of Radiation Programs.

Radiation Data and Reports, Vol 13, p 438-441, 1972. 2 fig, 3 tab, 4 ref.

Descriptors: *Radiation, *Radioactivity effects, *Measurement, *Tritium, *Pollutant identification, Distribution patterns, Background radiation, Nuclear reactors, Lethal limit, Precipitation (Atmospheric), Monitoring, Water pollution sources, Chemical analysis, Pollutants.

The results of tests for January through March, 1972, of the Tritium Surveillance System under the Environmental Protection Agency are analyzed. This network of monitoring stations was established in 1964 to measure and monitor tritium concentrations in major river systems and surface waters downstream from selected nuclear facilities. The program also measures tritium in precipitation. The results from all testing stations were included in enclosed tables. The highest individual concentration of tritium observed in drinking water was less than 0.2 percent of the Federal Radiation Council's Radiation Protection Guide. The highest concentration for surface water samples was 0.5 percent of the Radiation Protection Guide. Monthly analyses for tritium in precipitation were included. (Nielsen-Florida)
W73-05231

PARTICULATE BIOLUMINESCENCE IN DINOFLAGELLATES: DISSOCIATION AND PARTIAL RECONSTITUTION,
Johns Hopkins Univ., Baltimore, Md. McCollum-Pratt Inst.
C. W. Fuller, P. Kreiss, and H. H. Seliger.
Science, Vol 177, No 4052, p 884-885, September 8, 1972. 2 tab, 12 ref.

Descriptors: *Pyrrophyta, *Bioluminescence, *Dinoflagellates, *Physiological ecology, Assay, Bioassay, Protozoa, Animal physiology, Plant physiology, Marine algae, Phytoplankton, Kinetics, Separation techniques.
Identifiers: *Biochemical properties, Gonyaulax polyedra, Pyrodinium bahamense, Pyrocystis lunula, Luciferin, Luciferase, Particulate matter, Sample preparation.

With the same extraction conditions used for Gonyaulax polyedra, soluble and particulate bioluminescence can be isolated from two additional species, Pyrodinium bahamense and Pyrocystis lunula. Soluble luciferin and luciferase were dissociated from the particulate systems of all three species. Cells were grown at 25C using a photoperiod of 12 hours light followed by 12 hours darkness with illumination of 8800 lu/sq m (2000 lu/sq m for P. lunula). The particulate system was extracted from harvested cells by previously described methods. Soluble bioluminescence was assayed by adding a sample to a solution of 0.1 M phosphate buffer, ammonium sulfate, 0.001 M 2-mercaptoethanol and 1 mg of bovine serum albumin, and luciferase by the maximum rate of light emission with a saturating amount of luciferin. Luciferin was assayed by measuring the total light emitted with exogenous luciferase added to increase sensitivity. Particulate bioluminescence was assayed by injection of 0.1 ml of a sample into 1.9 ml of citrate-phosphate buffer (final pH 5.7, the optimum for all three species). In all three species the addition of exogenous luciferin to a particulate system that had been stimulated by acid and resuspended at pH 8.2 recharged the system, so that it again emitted a flash of light when the pH was lowered to 5.7. The activity of the luciferin-

recharged particles in the presence of soluble luciferin was always higher than the activity of these particles after centrifugation and resuspension in buffer free of luciferin. Comparison of kinetics, profiles of activity as a function of pH, and emission spectra for 'native' and recharged particulate systems offers evidence that recharging may be a physiological event. (Holoman-Battelle)
W73-05255

ABANDONED LARVACEAN HOUSES: A UNIQUE FOOD SOURCE IN THE PELAGIC ENVIRONMENT,
California Univ., Davis. Graduate Group in Ecology.
A. L. Alldredge.
Science, Vol 177, No 4052, p 885-887, September 8, 1972. 1 fig, 1 tab, 11 ref.

Descriptors: *Copepods, *Food webs, *Path of pollutants, *Nannoplankton, Scuba diving, Zooplankton, Invertebrates, Foods, On-site data collections, Photography, Marine animals, Crustaceans, Neritic, Dinoflagellates, Diatoms, Protozoa, Marine algae.
Identifiers: *Tunicates, *Food sources, Particulate organic matter, Pelagic animals, Ostracods, Marine environment, Harpacticoids, Calanoida, Cyclopoida, Oncaea mediterranea, Microsetella norvegica, Paracalanus aculeatus, Conchoecia rotundata, Oikopleura longicauda, Oikopleura fusiformis, Megalocercus abyssorum, Coccolithophores, Silicoflagellates, Tintinnids.

Direct field and laboratory observations are reported of copepods feeding on the clogged filters of abandoned larvacean (tunicates) houses in the open ocean. Field observations were made at 10-15 m in the Florida Current 6-10 km west of Bimini, Bahamas using conventional scuba techniques. Abandoned houses were identified to species according to their size, shape, and the presence of a filtering apparatus. Those of greatest abundance were of Oikopleura longicauda, Oikopleura fusiformis, and Megalocercus abyssorum. Up to 33 percent of the abandoned larvacean houses observed on 15 dives had one to five Oncaea mediterranea (Copepoda: Cyclopoida) resting on the incurrent filters or darting about on the inner apparatus, where particles are collected. Abandoned house filters contain naked dinoflagellates, coccolithophores, unidentified organic particles, and a few diatoms, silicoflagellates, and tintinnids. An examination of the copepod fecal pellets revealed coccolith fragments and unidentified organic matter. This discovery of the use of concentrated nannoplankton on abandoned larvacean houses by pelagic copepods, as either a major or a supplementary food source, reveals avenues in the pelagic food web, of the form: nannoplankton from larvacean houses to copepods and other crustacea to carnivores. Techniques were also developed for photographing the larvacean houses in the field for the first time. (Holoman-Battelle)
W73-05256

SCHEME OF ANALYZING PRODUCTS OF MICROBIOLOGICAL TRANSFORMATION OF AROMATIC HYDROCARBONS (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Inst. of Biochemistry and Physiology of Microorganisms.
For primary bibliographic entry see Field 05A.
W73-05258

THEORETICAL EVALUATION OF THE ELEMENTAL BALANCE DURING MICROBIAL CULTIVATION ON N-ALKANES AND N-ALCOHOLS (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Inst. of Biochemistry and Physiology of Microorganisms.
For primary bibliographic entry see Field 05A.
W73-05260

VIBRIO PSYCHROERYTHRUS SP. N.: CLASSIFICATION OF THE PSYCHROPHILIC MARINE BACTERIUM, NRC 1004,
Ottawa Univ. (Ontario). Dept. of Biology.
For primary bibliographic entry see Field 05A.
W73-05261

ECOLOGY OF SULFUR-OXIDIZING BACTERIA IN HOT ACID SOILS,
Indiana Univ., Bloomington. Dept. of Microbiology.
C. B. Fliermans, and T. D. Brock.
Journal of Bacteriology, Vol 111, No 2, p 343-350, August, 1972. 4 fig, 1 tab, 18 ref.

Descriptors: *Sulfur bacteria, *Acidic soils, *Distribution patterns, *Ecology, Sulfur, Temperature, Statistical methods, Radioactivity techniques, Spectrophotometry, Bioindicators, Thermal pollution, Hydrogen ion concentration, Sulfur compounds, Carbon dioxide, Incubation, Sampling, Photosynthesis, Algae.
Identifiers: *Autotrophic bacteria, Sulfuric acid, Carbon dioxide fixation, Fluorescence microscopy, Thermal soils, Chemoautotrophs, Yellowstone National Park, Thiobacillus thiooxidans, Sulfolobus acidocaldarius, Cyanidium caldarium, Culturing techniques.

The distribution of the sulfur-oxidizing bacteria Thiobacillus thiooxidans and Sulolobus acidocaldarius were studied as a funtion of soil temperature and pH in several thermal areas of Yellowstone National Park. Bacterial numbers were measured by a most-probable number (MPN) method and bacterial activity was determined by isotopic carbon dioxide fixation. A dilution technique was used to measure the pH of highly acidic soils and the amount of elemental sulfur in soil samples was determined by a direct spectrophotometric method. Thiobacillus thiooxidans is present at temperatures below 55C and Sulfolobus acidocaldarius at temperatures of 55-85C. The data indicate that sulfur-oxidizing bacteria are responsible for production of sulfuric acid in acidic thermal habitats. Physical and chemical parameters of these soils were also measured and are described. (Mortland-Battelle)
W73-05262

ESCHERICHIA COLI O ANTIGEN TYPING BY MEANS OF A MECHANIZED MICROTECHNIQUE,
Rijksinstituut voor de Volksgezondheid, Bilthoven (Netherlands). Lab. of Bacteriology.
For primary bibliographic entry see Field 05A.
W73-05263

AN OBLIGATELY AUTHOTROPHIC MUTANT OF CHLAMYDOMONAS DYSOSMOS: A BIOCHEMICAL ELUCIDATION,
A. H. Neilson, O. Holm-Hansen, and R. A. Lewin.
Journal of General Microbiology, Vol 71, No 1, p 141-148, June, 1972. 5 fig, 18 ref.

Descriptors: *Biological properties, Photosynthesis, Metabolism, Carbon, Biodegradation, Chlamydomonas, Aquatic algae, Protozoa, Enzymes, Absorption, Ultraviolet radiation.
Identifiers: *Mutants, *Biochemical characteristics, *Chlamydomonas dysosmos, Heterotrophy, Autotrophy, Flagellates, Substrate utilization, Biosynthesis, Adenosine triphosphate, Acetates, Substrates, Isocitrate lyase.

A biochemical elucidation is present for an obligately autotrophic mutant of Chlamydomonas dysomos, a unicellular, flagellate, green alga. Wild-type cells, normally photosynthetic, are also facultatively heterotrophic, being capable of growth in darkness with acetate as sole source of carbon. A mutant induced by ultraviolet light lacked the ability to grow heterotrophically and formed negligible amounts of isocitrate lyase after 70 h in darkness with acetate, the specific activity being less than 3 percent of that found in the wild-type. Uptake of acetate after 9 hours was 0.3 percent of that by the wild-type. ATP increased slightly during the first 10 hours after addition of acetate and thereafter decreased, in contrast to wild-type cells, in which ATP synthesis continued under similar conditions. Thus C. dysosmos could normally incorporate acetate for heterotrophic growth via the glyoxylate cycle but, in the mutant, this cycle was impaired, the alga being unable to synthesize isocitrate lyase and being thereby rendered obligately autotrophic. (Byrd-Battelle)
W73-05264

THE PHYSIOLOGICAL ROLE OF TETRATHIONATE RESPIRATION IN GROWING CITROBACTER,
Karlova Universita, Prague (Czechoslovakia). Dept. of Microbiology.
F. Kapralek.
Journal of General Microbiology, Vol 71, No 1, p 133-139, June, 1972. 1 fig, 6 tab, 25 ref.

Descriptors: *Growth rates, *Aerobic bacteria, *Respiration, Carbon, Nitrates, Nitrites, Cultures, Colorimetry, Metabolism, Oxidation-reduction potential, Biondicators, Biomass.
Identifiers: *Tetrathionate, *Citrobacter, Thiosulfates, Glucose, Galactose, Pyruvate, ATP, Bacterial physiology.

The effect of tetrathionate respiration on the growth rate and growth yield of Citrobacter is described. Citrobacter was grown at 30C on a medium in which lactose was replaced by glucose, galactose, or pyruvate as electron acceptors. Both aerobic and anaerobic cultures were grown and growth rates were monitored on a colorimeter. The experiments showed that the reduction of tetrathionate enchances the specific growth rate, raises the growth yield, and enables growth on non-fermentable carbon sources. Thus it resembles the respiratory reduction of nitrate to nitrite. The formation of ATP as a result of tetrathionate respiration amounts to only two-thirds of that resulting from nitrate respiration. (Mortland-Battelle)
W73-05265

EFFECT OF EVAPORATION LOSSES ON EXPERIMENTAL CONTINUOUS CULTURE RESULTS,
University of Manchester Inst. of Science and Technology (England). Dept. of Chemical Engineering.
W. R. King, C. G. Sinclair, and H. H. Topiwala.
Journal of General Microbiology, Vol 71, No 1, p 87-92, June, 1972. 3 fig, 10 ref.

Descriptors: *Evaporation, *Mathematical models, Kinetics, Mathematical studies, Growth rates, Metabolism, Oxidation, Bacteria, Fungi.
Identifiers: *Continuous cultures, *Error sources, Endogenous metabolism, Substrate utilization, Experimental error.

It is shown mathematically that in continuous cultures at dilution rates below 0.05 per hr, evaporation can lead to errors in measurement of parameters such as yield and maintenance coefficient. The rate of evaporation is a function of several parameters, including the stirrer speed, the temperature and humidity of the inlet air, the temperature of the liquid medium, the flow rate of air and the design of the vessel. Curves are developed that indicate that for negligible endogenous metabolism the accepted formula that connect dilution rate, the organism concentration under evaporating conditions, and the substrate concentration under evaporating conditions need modification at low dilution rates with resulting modifications in Herbert's endogenous metabolism model. It is concluded that errors in organism concentration are especially significant for systems with low en-

dogenous metabolism rates when no special precautions are taken to avoid evaporation losses. (Mortland-Battelle)
W73-05266

CHEMOTAXONOMIC CHARACTERS AND CLASSIFICATION OF SOME NOCARDIOFORM BACTERIA,
Polish Academy of Sciences, Wroclaw. Inst. of Immunology and Experimental Therapy.
For primary bibliographic entry see Field 05A.
W73-05267

ARE PLASTIDS DERIVED FROM PROKARYOTIC MICRO-ORGANISMS. ACTION OF ANTIBIOTICS ON CHLOROPLASTS OF EUGLENA GRACILIS,
Komenskeho Universita, Bratislava (Czechoslovakia). Dept. of Bicrobiology.
For primary bibliographic entry see Field 05C.
W73-05268

EFFECTS OF GROWTH RATE AND INFLUENT SUBSTRATE CONCENTRATIONS ON EFFLUENT QUALITY FROM CHEMOSTATS CONTAINING BACTERIA IN PURE AND MIXED CULTURE,
Purdue Univ., Lafayette, Ind. School of Civil Engineering.
C. P. L. Grady, Jr., L. J. Harlow, and R. R. Riesing.
Biotechnology and Bioengineering, Vol 14, No 3, p 391-410, May, 1972. 6 fig, 4 tab, 22 ref.

Descriptors: *Growth rates, *Bacteria, *Effluents, *Chemical oxygen demand, E. coli, Chemical analysis, Regression analysis, Essential nutrients, Deficient elements, Coliforms, Laboratory equipment, Environmental effects, Statistical methods, Colorimetry, Methodology.
Identifiers: *Chemostat, *Substrate concentration, *Pure cultures, *Mixed cultures, Culture media, Aerobacter aerogenes, Growth kinetics, Culturing techniques, Influents, Axenic cultures, Potentiometric titration.

Studies were performed using pure cultures of A. aerogenes and E. coli and a heterogeneous microbial population growing in carbon-limited chemostats with gluscose as the sole carbon and energy source. A two-level factorial experimental design was employed to test the hypothesis that the concentration of growth-limiting substrate in a chemostat is controlled by the growth rate alone and is independent of the concentration of substrate entering the reactor. The pure culture experiments showed that the conclusions depend upon the measurement employed for growth-limiting substrate. When the concentration of glucose was measured directly, the hypothesis was found to be true within the limits of the study (500-1500 mg/liter). However, if the chemical oxygen demand (COD) test was used as the measure of growth-limiting substrate the hypothesis was found to be false. When heterogeneous cultures were employed the hypothesis was false regardless of the technique used to measure the concentration of growth-limiting substrate. Nevertheless, it was possible to generate regression equations which described the interactions among influent COD, growth rate, and effluent COD with a high level of correlation. (Long-Battelle)
W73-05269

PRODUCTION OF AN AUTOINHIBITOR BY A THERMOPHILIC BACILLUS,
Massachusetts Inst. of Tech., Cambridge. Dept. of Nutrition and Food Science.
For primary bibliographic entry see Field 05A.
W73-05270

ROLE OF IRON AND SULFUR IN PIGMENT AND SLIME FORMATION BY PSEUDOMONAS AERUGINOSA,
Eastern Regional Research Lab., Philadelphia, Pa.
S. A. Palumbo.
Journal of Bacteriology, Vol 111, No 2, p 430-436, August, 1972. 5 fig, 2 tab, 37 ref.

Descriptors: *Sulfur, *Pigments, *Iron, *Slime, Pseudomonas, Sulfates, Flourescence, Growth rates, Turbidity, Bioindicators, Cultures, Viscosity, Spectrophotometry, Separation techniques, Pollutant identification.
Identifiers: *Pseudomonas aeruginosa, Pyocyanine, Sulfites, Phenazines, Pyorubrin, Culture media.

Media and an analytical scheme have been developed which allow both a qualitative and quantitative estimation of the formation of pyocyanine, related phenazines, pyorubrin, and a blue and yellow-green flourescent pigment by Pseudomonas aeruginosa. P. aeruginosa was grown in the defined pyocyanine medium of Frank and De Moss (1959) at 30C. The medium was changed as necessary for experimental purposes by changing the sulfur source or by omitting various components. Pigments were differentiated by the characteristics of Meader, Leonard, and Robinson (1925). Flourescence was determined quantitatively on a spectrophotofluorometer. Spectrophotometry was used to determine pyocyanine, related phenazines, and pyorubrin. When sulfite was the sulfur source with or without iron, P. aeruginosa formed either a yellow-green or a blue fluorescent pigment. Formation of fluorescent pigments of P. aeruginosa is related to the ability of sulfite to act as a specific sulfur source. In an investigation of the role of both added iron and sulfur sources, complex patterns of pigment formation were observed. In addition to the fluorescent pigments, sulfite also supported the formation of slime by P. aeruginosa. (Mortland-Battelle)
W73-05274

ISOLATION AND CHARACTERIZATION OF N--BUTANE-UTILIZING MICROORGANISMS,
Toronto Univ. (Ontario). Dept. of Chemical Engineering and Applied Chemistry.
For primary bibliographic entry see Field 05A.
W73-05276

ENRICHMENT AND SELECTIVE ISOLATION OF CARYOPHANON LATUM,
Mount Allison Univ., Sackville, (New Brunswick). Dept. of Biology.
For primary bibliographic entry see Field 05A.
W73-05277

A PH-DEPENDENT SUCCESSION OF IRON BACTERIA,
Harvard Univ. Cambridge, Mass. Lab. of Applied Microbiology.
For primary bibliographic entry see Field 05A.
W73-05280

INFRARED ESTIMATION OF OIL CONTENT IN SEDIMENTS IN PRESENCE OF BIOLOGICAL MATTER,
Cincinnati Univ., Ohio. Dept. of Chemistry.
For primary bibliographic entry see Field 05A.
W73-05282

CELLULOLYTIC ACTIVITY OF THERMOMONOSPORA CURVATA: NUTRITIONAL REQUIREMENTS FOR CELLULASE PRODUCTION,
Weber State Coll., Ogden, Utah. Dept. of Microbiology.
F. J. Stutzenberger.
Applied Microbiology, Vol 24, No 1, p 77-82, July 1972. 7 fig, 1 tab, 18 ref.

Descriptors: Cotton, Temperature, Cultures, *Cellulose, Growth, Water pollution sources, Enzymes, Thermophilic bacteria, Actinomycetes, *Microbial degradation, Essential nutrients, Nutrient requirements, Carbohydrates, Assay.
Identifiers: *Thermomonospora curvata, *Cellulase, Culture media, Substrate utilization, Enzyme production.

Nutritional requirements are described for growth cellulase production, and cellulose degradation by Thermomonospora curvata in a minimal medium. The use of a minimal medium for cellulase (C sub 1 and C sub x) production by Thermomonospora curvata increased extracellular C sub 1 activity (measured by rate of cotton fiber hydrolysis) 11-fold, compared with the previously used yeast extract medium. Ground cotton fibers supported the highest cellulase production when compared to other soluble and insoluble carbohydrate sources. Maximal cellulase production occurred at 45 C, slightly less at 55 C, and was insignificant at 65 C (the highest temperature at which cellulase activity appeared stable). At a temperature of 55 C, an optimal pH of 8.0, and a cotton fiber concentration of 8 mg/ml, shake cultures of T. curvata degraded about 75 percent of the cellulose during the 10-day period. (Byrd-Battelle)
W73-05285

EFFECT OF SEPTIC-TANK WASTES ON QUALITY OF WATER, IPSWICH AND SHAWSHEEN RIVER BASINS, MASSACHUSETTS,
Geological Survey, Boston, Mass.
For primary bibliographic entry see Field 05C.
W73-05301

EFFECTS OF SEDIMENT ON WATER QUALITY,
Illinois State Water Survey, Urbana.
J. B. Stall.
Journal of Environmental Quality, Vol 1, No 4, p 353-360, October-December 1972. 5 fig, 4 tab, 28 ref.

Descriptors: *Sediment load, *Turbidity, *Sediment yield, *Illinois, *Water pollution effects, Water pollution, Path of pollutants, Soil erosion, Water chemistry, Water quality, Urbanization, Erosion control, Sediment control, Turbidity.

Flowing water in a stream carries sediment which is considered a pollutant because it interferes with many uses of water. Other pollutants in the water may be attached to or greatly affected by the sediment. The ultimate source of most sediment is soil loss from sheet erosion. Soil loss may be as high as 100 metric tons/ha per year on a steep, loose, cropped soil, or on any soil left bare during construction activity. Nearly level land in Illinois may lose 10 tons/ha per year regularly. Rivers carry a load of suspended sediment as a part of their total energy balance. If the suspended sediment load of a river is reduced, the stream will erode its bed or banks to pick up sediment to re-establish its energy balance. Traditional soil conservation measures will reduce soil loss from the farmer's field; this will also reduce sediment yield to a downstream reservoir. Reductions are often 70% to 90%. (Knapp-USGS)
W73-05315

SEDIMENT-WATER INTERACTIONS,
Illinois Univ., Urbana. Dept. of Agronomy.
W. R. Oschwald.
Journal of Environmental Quality, Vol 1, No 4, p 360-366, October-December 1972. 1 fig, 2 tab, 46 ref.

Descriptors: *Sediment load, *Water chemistry, *Path of pollutants, *Water pollution effects, Water quality, Water pollution, Sorption, Turbidity.
Identifiers: *Sediment-water interactions.

Sediment originating from soil erosion has physical, chemical, and biological effects on water resource use. Sediment particles pollute water to the extent that their presence reduces water quality for a particular use. Sediment in water provides a surface for the sorpiton and desorption of potential pollutants. The sediment particles may scavenge or remove substances such as nutrients, pesticides, heavy metals, and radioactive isotopes from water. The sorbed substances may be fixed so that they no longer are available as pollutants. They may be contacted by aquatic organisms and concentrated in the aquatic food chain. Deposits of sediments with their sorbed constituents may be buried by later deposition. The buried deposits may be re-exposed or transported to new locations. The effects of sorption and desorption may be different in short-term and long-term periods. Sediment influences eutrophication through deposition of sediments and through nutrients released from the sediments. The depositon effects are more obvious and may have greater effect on eutrophication than the nutrients in the sediments. (Knapp-USGS)
W73-05316

GROUNDWATER CONTAMINATION AND SINKHOLE COLLAPSE INDUCED BY LEAKY IMPOUNDMENTS IN SOLUBLE ROCK TERRAIN,
Missouri Geological Survey and Water Resources, Rolla.
T. J. Aley, J. H. Williams, and J. W. Massello.
Missouri Geological Survey and Water Resources Engineering Geology Series No 5, 1972. 32 p, 10 fig, 1 tab, 36 ref.

Descriptors: *Subsidence, *Sinks, *Karst, *Karst hydrology, *Missouri, Reservoir leakage, Water pollution sources, Water pollution effects, Path of pollutants, Seepage, Recharge, Land subsidence.
Identifiers: *Sinkhole collapse.

One effect of leaky impoundments can be to induce catastrophic sinkhole collapse which may endanger life and property. A second effect is groundwater contamination by accidental introduction of poor quality water underground. Where secondary porosity of bedrock (due mainly to solution) is significant, sinkholes, caves, springs, disappearing and losing streams, and other karst features are common. Technical literature on sinkhole collapse and groundwater contamination is reviewed. Some of the most pertinent information comes from the soluble rock terrain of the Far West Rand in South Africa. In this area deep mining has greatly altered natural groundwater conditions and has been responsible for numerous sinkhole collapses with attendant loss of life and damage to property. Cases of land collapse in Missouri are related to sewage lagoons, leaky impoundments, and other construction which has changed groundwater regimens. Eight of the collapses were apparently unrelated to man's activities (although agricultural practices could have been involved). These hazards are significant in Missouri and pose a serious environmental threat. (Knapp-USGS)
W73-05331

WATER QUALITY CHARACTERISTICS OF STORM SEWER DISCHARGES AND COMBINED SEWER OVERFLOWS,
Illinois State Water Survey, Urbana.
V. Kothandaraman.
Circular 109, 1972. 19 p, 1 fig, 6 tab, 49 ref.

Descriptors: *Water quality, *Water pollution sources, *Urban runoff, *Storm runoff, *Combined sewers, Overflow, Storm drains, Inflow, Surface waters, Streams, Lakes, Chemical analysis, Suspended solids, Chemical oxygen demand, Biochemical oxygen demand, Nitrogen, Phosphorus, Coliforms, Sampling, Hydrologic data, Data collections, Pollution abatement, Costs, Reviews.

With increasing urban development and more stringent water quality standards for receiving streams, urban storm runoff has become recognized as a significant source of pollution. This circular, which is based upon a review of pertinent case studies of various cities in the United States, emphasizes the water quality aspects. Characteristics of combined and separate storm sewer discharges, the storm water pollution load estimates and models, the impact of storm runoff on receiving waters, and methods and estimated costs for pollution abatement are summarized. The quality and quantity of storm runoff depends on several factors. Intensity, duration, and areal extent of storms, and the time intervals between successive storms have significant effects both on the quantity and quality of runoff. Land contours, land uses, population densities, incidence and nature of industries, size and layout of sewer systems, and other factors also have their influence. (Woodard-USGS)
W73-05333

NONPOINT RURAL SOURCES OF WATER POLLUTION,
Illinois State Water Survey, Urbana.
S. Lin.
Circular 111, 1972. 36 p, 4 fig, 20 tab, 84 ref.

Descriptors: *Water pollution sources, *Farm wastes, *Fertilizers, *Sediment transport, *Reviews, Evaluation, Agriculture, Feed lots, Overland flow, Runoff, Infiltration, Nitrogen, Phosphorus, Pesticides, Soil erosion, Streams, Lakes, Inflow, Water quality, Chemical analysis, Water quality control, Waste treatment, Waste disposal, Suspended solids.
Identifiers: *Farm wastes literature review.

A literature survey was made to define the quantity and characteristics of nonpoint water pollution sources from rural areas. Major constituents of such pollution include fertilizers, pesticides, erosion and sediment, and animal wastes. Nitrogen and phosphorus from surface runoff and subsurface drainage are often greater in concentration than that from sewage effluents. Pesticides are only slightly soluble in water, and about 5 percent of that applied may enter waterways through surface runoff and erosion. Soil erosion and nutrient losses can be minimized by conservation measures and proper fertilizer application. With the exception of sediment transport, farm animal wastes can be the most serious sources of pollution from farm lands. The effluent quality of current animal waste treatment processes is substantially less than that achievable for domestic sewage. Conventional sewage treatment processes cannot be directly applied to animal wastes. In the United States, the application of nitrogen in commercial fertilizers has risen from less than 400,000 tons in 1940 to about 7,000,000 tons in 1970. In Illinois, nitrogen applications increased from about 120,000 tons in 1960 to 600,000 tons in 1968 causing an upward trend in nitrate concentrations in some surface waters in Illinois. Pertinent data are tabulated for various parts of the United States. (Woodard-USGS)
W73-05334

NITRATE AND NITRITE VARIATION IN GROUND WATER,
Wisconsin Dept. of Natural Resources, Madison.
K. T. Crabtree.
Technical Bulletin No 58, 1972. 22 p, 14 fig, 8 tab, 99 ref.

Descriptors: *Nitrates, *Water pollution sources, *Fertilizers, *Groundwater, *Wisconsin, Water wells, Ammonia, Nitrites, Sampling, Chemical analysis, Data collections, Agriculture, Rainfall, Groundwater recharge, Correlation analysis.
Identifiers: *Marathon County (Wis).

Studies of the magnitude and variation of nitrate and nitrite concentrations in private well water were made in the central Wisconsin farm area of Marathon County, and 55% of the wells contained nitrate concentration of 45 mg/liter or more. Among 242 wells investigated, 82 private wells were sampled 2 times/month for a period of 14 months. Nearly 70% of the 82 wells contained nitrate levels of 45 mg/liter or greater at one time or another during the sampling period and about 45% of the wells contained nitrate levels of 45 mg/liter or more throughout the period. The variations in nitrate concentration were closely related to amount of precipitation, and concentration was highest during heavy rainy season and lowest during dry period for the majority of wells examined. Nitrate and nitrite in well water may be derived from both autotrophic and heterotrophic nitrification following ammonification of organic fertilizer (manure). Kinetics of heterotrophic nitrification by mixed culture system using partially oxidized poultry wastes having high ammonium-N, organic-N, and energy source yielded nitrate concentrations ranging from 370 to a maximum of 1131 mg/liter/day. (Woodard-USGS)
W73-05335

NEED FOR CONTROLLING SALINITY OF THE COLORADO RIVER.
Colorado River Board of California, Los Angeles.
For primary bibliographic entry see Field 05G.
W73-05352

AN EVALUATION OF DDT AND DIELDRIN IN LAKE MICHIGAN.
Lake Michigan Enforcement Conference. Lake Michigan Interstate Pesticides Committee.

Copy available from GPO Sup Doc as EP 1.23:72-003, $1.25; microfiche from NTIS as PB-214 696, $0.95. Environmental Protection Agency, Ecological Research Series, EPA-R3-72-003, August 1972. 139 p, 4 fig, 34 tab, 39 ref, 8 append. EPA Program, 16050EYV, EYS, EPV, ESP.

Descriptors: *Pesticides, *DDT, *Dieldrin, *Lake Michigan, Evaluation, Monitoring, Chlorinated hydrocarbon pesticides, Fish, Legislation, Agriculture, Fruit crops, Sewage treatment, Polychlorinated biphenyls, Clams, Wisconsin, Michigan, Indiana, Illinois, Water pollution sources, Urban drainage, Bioindicators, Food chains, Reproduction, Sediments, Tributaries.
Identifiers: Inshore waters, Phthalate esters.

An investigational program was designed to provide information essential to evaluate the impact of pesticides on Lake Michigan. Data were collected from waters, wastewaters, invertebrate organisms, and fish; analysis of samples from open water for the purpose of developing general residue levels was impractical. Biological accumulation potential is greater in inshore waters since most of the important biological representatives spend extended periods of time within these areas. Tributary streams to Lake Michigan discharge chlorinated hydrocarbon pesticides into the lake; urban and fruit-growing areas are the more significant contributors of pesticides than are diversified agricultural areas. The polychlorinated biphenyls are present in sufficient quantity, with sufficient evidence of biological impact, to warrant independent evaluation. Resident fish appear to be the most reliable biological monitor. The biological magnification of chlorinated hydrocarbon insecticides in sport and commercially valuable fish species suggests that fish should be used to reflect concentration trends. Effect of the pesticides in Lake Michigan on fish reproduction potential is not yet resolved. The pesticides, through biological magnification, may have a potential effect on both domestic and wild animals that eat fish or other organisms from the lake. (Jones-Wisconsin)
W73-05380

BIOCHEMICAL STUDIES ON MINAMATA DISEASE III. RELATIONSHIPS BETWEEN THE CAUSAL AGENT OF THE DISEASE AND THE MERCURY COMPOUND IN THE SHELLFISH WITH REFERENCE TO THEIR CHEMICAL BEHAVIORS,
Kumamoto Univ. (Japan). Medical School.
For primary bibliographic entry see Field 05C.
W73-05390

BIOCHEMICAL STUDIES ON MINAMATA DISEASE V. AN APPROACH FOR CHEMICAL SYNTHESIS OF THE CAUSAL AGENT OF MINAMATA DISEASE METHYL METHYLMERCURIC SULFIDE,
Kumamoto Univ. (Japan). Medical School.
For primary bibliographic entry see Field 05C.
W73-05392

STUDIES ON THE ORIGIN OF THE CAUSATIVE AGENT OF MINAMATA DISEASE I. ORGANIC MERCURY COMPOUND IN THE FISH AND SHELLFISH FROM MINAMATA BAY,
Kumamoto Univ. (Japan). Medical School.
For primary bibliographic entry see Field 05C.
W73-05393

STUDIES ON THE ORIGIN OF THE CAUSATIVE AGENT OF MINAMATA DISEASE II. COMPARISON OF THE MERCURY COMPOUND IN THE SHELLFISH FROM MINAMATA BAY WITH MERCURY COMPOUNDS EXPERIMENTALLY ACCUMULATED IN THE CONTROL SHELLFISH,
Kumamoto Univ. (Japan). Medical School.
For primary bibliographic entry see Field 05C.
W73-05394

STUDIES ON THE ORIGIN OF THE CAUSATIVE AGENT OF MINAMATA DISEASE III. INDUSTRIAL WASTES CONTAINING MERCURY COMPOUNDS FROM MINAMATA FACTORY,
Kumamoto Univ. (Japan). Medical School.
For primary bibliographic entry see Field 05C.
W73-05395

IS MERCURY FROM HAWAIIAN VOLCANOES A NATURAL SOURCE OF POLLUTION,
Hawaii Univ., Honolulu.
A. Eshleman, S. M. Siegel, and B. Z. Siegel.
Nature, Vol 233, p 471-472, October 15, 1971. 2 tab, 7 ref.

Descriptors: *Mercury, *Air pollution, *Volcanoes, *Hawaii, Heavy metals, Sampling, Analytical techniques, Trace elements, Path of pollutants, Pollutant identification.
Identifiers: *Mercury pollution, Gaseous pollutants, Boiling points.

Atmospheric mercury was obtained by drawing 0.2-0.4 cu.m. of air through 15 x 150 mm U-tubes containing traps of 10 ml. of concentrated H2SO4, 1 ml. of concentrated nitric acid and about 500 mg of powdered copper. Field air samples were collected primarily using a portable battery-powered pump. The results show that 98% of the mercury issuing from the Hawaiian fumaroles is either in the form of a gas or of particles less than 0.3 microns in diameter. Several mercury compounds as well as the pure metal may become gaseous under the conditions of temperature and pressure found in volcanic fumaroles. The magnitudes of mercury content in these fumaroles' discharges agree quite well with reports from thermal areas in Kamchatka and the Kuriles. The background figures for Honolulu seem high when compared with other reports, but this may be because this site is close to a volcano. (Oleszkiewicz-Vanderbilt)
W73-05396

ESTIMATION OF MIXED PHENYL AND ETHYL MERCURIC COMPOUNDS,
Western Washington Research and Extension Center, Puyallup.
For primary bibliographic entry see Field 05A.
W73-05397

ACCELERATED ELIMINATION OF METHYL MERCURY FROM ANIMALS,
Kumamoto Univ. (Japan). Medical School.
For primary bibliographic entry see Field 05C.
W73-05398

RESTORATION OF MERCURY CONTAMINATED LAKES AND RIVERS,
Swedish Water and Air Pollution Research Lab., Stockholm.
For primary bibliographic entry see Field 05G.
W73-05400

EXCRETION OF STRONTIUM 90 AND CESIUM 137 WITH FISH EGGS DURING SPAWNING, (IN RUSSIAN),
Akademiya Nauk SSSR, Sverdlovsk. Inst. of Plant and Animal Ecology.
N. V. Kulikov, V. G. Kulikova, and S. A. Lyubimova.
Ekologiya. Vol 2, No 4, p 12-16. 1971. Illus.
Identifiers: *Cesium-137, Eggs, Esox-Lucius, Excretion, Fish, Spawning, *Strontium-90, Tinca-Tinca.

A quantitative determination is presented of the excretion of Sr90, Cs137, Ca, Mn, and K from female tench (Tinca tinca) and pike (Esox lucius) with their eggs during spawning under natural conditions. The coefficients of discrimination of Sr90 relative to Ca and Mg and of Cs137 relative to K upon uptake of these elements from the aquatic environment into the fishes and their excretion from the fishes with eggs are presented.--Copyright 1972, Biological Abstracts, Inc.
W73-05402

CHEMICAL ENHANCEMENT OF THE BIODEGRADATION OF CRUDE-OIL POLLUTANTS,
Petrolite Corp., Webster Groves, Mo.
For primary bibliographic entry see Field 05G.
W73-05414

GENERAL CIRCULATION AND WATER CHARACTERISTICS IN THE SOUTHERN CALIFORNIA BIGHT,
Southern California Coastal Water Research Project, Los Angeles.
J. H. Jones.
Report, October, 1971. 41 p, 17 fig, 211 ref.

Descriptors: *Water circulation, *Upwelling, *Currents, *Water temperature, Physical properties, Pollutants, Mixing.
Identifiers: *California Bight, *Aperiodic fluctuations.

Some aspects of the physical oceanography in the Southern California Bight, as they relate to the effects of pollutants in the area, are reviewed. Physical characteristics of the Bight, such as currents, advection and dilution are studied in light of their influence upon the mixing and diffusion of chemical pollutants. Information concerning seasonal fluctuations, upwelling, aperiodic fluctuations and long-term temperature variations in the Bight is presented. A basic understanding and subsequent forecasting of the fluctuation of conditions related to water quality off southern California will result from a study of the nearshore and offshore circulation. At the present time, however, available information on circulation in the Bight area does not deal with the dispersion of pollutants as they enter the ocean environment. (Ensign-PAI)
W73-05415

STUDIES OF BENTHONIC FORAMINIFERA IN THE RESTIGOUCHE ESTUARY: 1. FAUNAL DISTRIBUTION PATTERNS NEAR POLLUTION SOURCES,
Bedford Inst., Dartmouth (Nova Scotia). Atlantic Oceanographic Lab.
C. T. Schafer.
Maritime Sediments, Vol 6, No 3, p 121-134, December 1970. 3 fig, 2 tab, 18 ref, 4 append.

Descriptors: *Estuaries, *Industrial wastes, *Municipal wastes, *Waste water (Pollution), *Water pollution effects, *Water chemistry, Sediments, *Benthos, *Plankton, *Benthic fauna, *Distribution patterns, Seasonal, Spatial distribution, History.
Identifiers: *Restigouche Estuary, Benthonic Foraminifera, Late Quaternary study.

The Restigouche Estuary between Gaspe Peninsula, Quebec and northern New Brunswick is particularly well suited for the study of the effects of industrial and municipal waste discharges on the physical and chemical characteristics of the nearshore water and sediment and on the local distribution of benthonic foraminiferal populations. Areas along the Quebec shore that are relatively unpolluted are available for comparative studies. The long range goals are to determine seasonal and spatial variations in species distributions and foraminiferal number in the upper three centimeters of bottom sediment and to apply this information to a study of the Late Quaternary history of the estuary through micropaleontological analysis of core samples. Investigations suggest that the benthonic foraminifera in these areas are eurybathyic and that a decrease in species indicates an increase in environmental 'variability'. This 'variability' appears to be related primarily to man's activities and is reflected by the species diversity-abundance relationships of benthonic foraminifera. (Ensign-PAI)
W73-05419

EXCHANGE PROCESSES BETWEEN PETPESWICK INLET AND CONTINENTAL SHELF WATERS, A PRELIMINARY REPORT,
Bedford Inst., Dartmouth (Nova Scotia). Atlantic Oceanographic Lab.
R. H. Loucks, and H. E. Sadler.
Report 1971-5, June, 1971. 35 p, 8 fig, 4 tab, 11 ref, append.

Descriptors: *Inlets, *Dyes, *Water quality, Effluents, Water pollution control, Waste disposal, Temperature, Salinity, Path of pollutants.
Identifiers: *Petpeswick Inlet (Nova Scotia), *Shelf water, *Exchange dynamics.

The dynamics of the Petpeswick Inlet, the forces acting upon it, and the resulting exchanges of water and water quality parameters between the inlet and the shelf water are investigated. The exchange of salt and fresh water within the inlet is classified using the 1966 Hansen-Rattray model and the model's usefulness in forecasting water motions and exchanges is assessed. Also included is an investigation of the effects on the inlet of a proposed treated sewage effluent from an outfall in the upper Bay. Dye dispersion experiments were carried out in Upper Bay, along with observations of temperature, salinity, and phosphate content. Results indicated that exchange mechanisms vary with quality parameters in question as well as with location. (Ensign-PAI)
W73-05420

THE NATURE OF SHELLFISH AND ECOLOGICAL FACTORS CONTRIBUTE TO THEIR ROLE IN FOOD BORNE HUMAN DISEASE,
Missouri State Dept. of Public Health and Welfare, Springfield. Environmental Public Health.
For primary bibliographic entry see Field 05C.
W73-05421

INTERMEDIATE MIXING OF THERMAL DISCHARGES INTO A UNIFORM CURRENT,
Town School of Civil and Mechanical Engineering, Philadelphia, Pa.
J. E. Edinger, and E. M. Polk, Jr.
Water, Air and Soil Pollution, Vol 1, No 1, p 7-31, November 1971. 8 fig, 4 tab, 6 ref.

Descriptors: *Thermal pollution, *Dispersion, *Temperature distribution, *Currents (Water), *Heat balance, Mixing, Velocity, Width, Depth, Pumping, Mathematics, Equations.

There is an immediate need for simple analytic descriptions of the temperature distributions that result from the intermediate dispersion of a heated water discharge into a body of water. The study of dispersion into a uniform current is presented. The sequence of formulas provides a number of geometric laws that satisfy a heat balance during initial mixing. They are dimensionally correct and show interrelations of the basic parameters of waterbody velocity and dimensions such as width and depth, plant pumping rate, and source concentration. (Ensign-PAI)
W73-05422

OIL RECONNAISSANCE IN THE MAGDALEN ISLANDS - 1970,
Bedford Inst., Dartmouth (Nova Scotia). Atlantic Oceanographic Lab.
A. Ages.
Report 1971-8, September, 1971. 24 p, 16 fig.

Descriptors: *Oil spills, *Dispersion, Water pollution, Temperature, Wind, Fisheries, Path of pollutants.
Identifiers: *Irving Whale, *Magdalen Islands, *Reconnaissance, *Bunker C pour point.

Shore reconnaissance of the Magdalen Islands was undertaken after the 1970 Irving Whale oil spill. This reconnaissance and some of the findings are reported. Pollution of the islands occurred after the oil slick had been largely dispersed by the wind, so damage was minimal; the oil did not affect the eastern shores and lagoons, where the scallop fisheries are economically important. The principal factor minimizing the pollution threat was the high pour point (52 degrees F) of the ship's Bunker C cargo. As the oil escaped through the vents of the sunken barge, it cooled to 32 degrees F ambient temperature, congealed and sealed the vents. The oil's high pour point may have caused the sudden dispersal of the oil when it was disturbed by wind and waves. (Ensign-PAI)
W73-05427

DISTRIBUTION OF WASTE DEPOSITS IN NEW YORK HARBOR AND ADJACENT WATERS BASED ON CARBON CONTENTS AND LOSS-O-N-IGNITION (VOLATILE MATTER),
State Univ. of New York, Stony Brook. Marine Sciences Research Center.
M. G. Gross.
In: Survey of Marine Waste Deposits, New York Metropolitan Region. Technical Report No 8, April 1971. p 9-22, 6 fig, 3 tab.

Descriptors: *Waste deposits, *Organic matter, *Distribution, Sampling, Pollutants, *Path of pollutants.
Identifiers: *New York Harbor, *New York Bight, Loss on ignition, Total carbon content.

Distribution of wastes on the continental shelf and in the New York Harbor was mapped on the basis of the chemical characteristics of the wastes. An index which provided a measure of the abundance of organic matter was formulated. The abundance of organic matter in the waste deposits was measured on the basis of loss on ignition and total carbon content. The advantages and disadvantages of these two kinds of measurement are discussed. Analyses of the mapping indicated that the wastes on the offshore disposal sites were generally close to the designated disposal areas. The carbon-rich deposits were displaced about 1 Km from the designated disposal site. The results of the survey do not provide any compelling evidence of movement of carbon-rich wastes either toweard the Long Island or New Jersey coast. (Ensign-PAI)
W73-05430

ATOMIC ABSORPTION SPECTROMETRIC ANALYSES OF ACID-EXTRACTABLE MINOR ELEMENTS IN WASTES AND WASTE DEPOSITS,
State Univ. of New York, Stony Brook. Marine Sciences Research Center.
For primary bibliographic entry see Field 05A.
W73-05431

RECONNAISSANCE STUDIES OF BENTHIC ORGANISMS IN NEW YORK HARBOR AND ADJACENT WATERS,
Eastern Connecticut State Coll., Willimantic.
R. N. Smith.
In: Survey of Marine Waste Deposits, New York Metropolitan Region, New York State University, Stony Brook, Marine Sciences Research Center Technical Report No 8, April, 1971. p 38-55, 6 fig, 7 tab.

Descriptors: *Benthic fauna, *Distribution, *Brackish water, *Saline water, *Sampling, Environmental effects, Pollutants, Animal pathology.
Identifiers: *New York Harbor, *Species survey, *Ecological imbalance.

New York Harbor and its adjacent waters were surveyed in order to determine the distribution and abundance of common benthic macroscopic and microscopic marine and brackish water invertebrates. The aquatic environment within the surveyed area ranges from the open waters of the continental shelf to the less saline waters in the river channels. Findings show that in many areas of New York Harbor the benthic communities which normally can adapt to such varying environments are either drastically reduced in abundance or completely absent. These changes in the benthic communities are the result of human activity such as frequent dredging of the channels. On the basis of the distribution and abundance of the organisms surveyed, the New York Harbor region was divided into three areas which reflect the varying severity of the pollution problem. These areas in descending order of severity are: (1) Upper Bay, Newark Bay, Arthur Kill, East, Harlem, Hudson and Raritan Rivers, (2) Lower Bay and (3) Continental Shelf area. (Ensign-PAI)
W73-05432

BIOLOGICAL EFFECTS OF WASTE DISPOSAL IN WESTERN LONG ISLAND SOUND: AN INITIAL SURVEY,
Suffolk County Community Coll., Seldon, N.Y.
For primary bibliographic entry see Field 05C.
W73-05433

PRELIMINARY STUDY OF THE GLOBAL POLLUTION EFFECTS ON THE PLANKTON POPULATION IN THE NORTHERN HARBOUR OF MARSEILLES (ETUDE PRELIMINAIRE DES EFFETS DE LA POLLUTION GLOBALE SUR LE PEUPLEMENT PLANCTONIQUE DES PORTS NORD DE M ARSEILLE),
Centre Universitaire de Luminy, Marseille (France). Laboratoire d'Hydrobiologie Marine.
For primary bibliographic entry see Field 05C.
W73-05438

TEXAS GULF COAST SEDIMENTS AND WATER QUALITY MANAGEMENT,
Texas A and M Univ., College Station. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05G.
W73-05444

EFFECTS OF CERTAIN PARAMETERS ON BACTERIAL POLLUTION AT A COASTAL SITE,
Water Pollution Research Lab., Stevenage. (England).
For primary bibliographic entry see Field 05C.
W73-05450

THE EFFECTS OF POLLUTION ON MARINE ORGANISMS,
Ministry of Agriculture, Fisheries and Food, Burnham-on-Crouch (England). Fisheries Lab.
For primary bibliographic entry see Field 05C.
W73-05451

INDUSTRIAL ASPECTS OF COASTAL POLLUTION,
Imperial Chemical Industries Ltd., Brixham (England). Brixham Research Lab.
For primary bibliographic entry see Field 05C.
W73-05454

ASPECT OF PETROLEUM POLLUTANT ANALYSIS,
British Petroleum Co. Ltd., London (England).
For primary bibliographic entry see Field 05A.
W73-05457

THE EFFECT OF SOME CHEMICAL AND BIOLOGICAL FACTORS ON THE DEGRADATION OF CRUDE OIL AT SEA,
Naval Ordnance Inspection Lab., Caerwent (England).
For primary bibliographic entry see Field 05G.
W73-05462

SOME ASPECTS OF THE HAMILTON TRADER OIL SPILL,
For primary bibliographic entry see Field 05G.
W73-05467

PRELIMINARY RESULTS OF INJECTING HIGHLY TREATED SEWAGE-PLANT EFFLUENT INTO A DEEP SAND AQUIFER AT BAY PARK, NEW YORK,
Geological Survey, Washington, D.C.
J. Vecchioli, and H. F. H. Ku.
Available from GPO, Washington, DC 20402 - Price $0.30 cents. Geological Survey Professional Paper 751-A, 1972. 14 p, 6 fig, 8 tab, 16 ref.

Descriptors: *Waste disposal wells, *New York, *Injection wells, Well screens, Underground waste disposal, Well filters, Turbidity, Particle size, Water quality, Tertiary treatment, Bacteria.
Identifiers: Long Island (NY), Well clogging.

Highly treated sewage-plant effluent is injected into a sand aquifer at Bay Park, N.Y., through a fiberglass-cased well finished with a gravel-packed 16-inch diameter stainless-steel screen set between 418 and 480 feet below land surface. The well is open to the Magothy aquifer. Maximum recharge rate is 360 gallons per minute. Head buildup in the injection well (but not the aquifer) in each injection test exceeded that predicted by pumping-test data even though the water injected had a physical and chemical quality acceptable for drinking water. In one test, the specific capacity of the injection well was reduced to half the preinjection value after 10 days of injection. Excessive head buildup is strongly dependent upon the turbidity of the recharge water, even though turbidity levels are generally less than 2 mg per liter as SiO2. The fine-grained nature of the aquifer probably accounts for the well's high sensivity to small amounts of suspended matter. Redevelopment by pumping after each injection test resulted in restoration of most of the specific capacity

prevailing prior to each test. The first slug of water recovered during redevelopment is very turbid and the concentrations of iron, phosphate, and volatile solids are many times greater than those of the injected water. Bacterial content is also many times greater, and this together with other evidence suggests that some deterioration in well capacity may be a result of biologic clogging. (Knapp-USGS)
W73-05471

MERCURY DISTRIBUTION LEVELS OBSERVED IN VARIOUS ECOSYSTEMS AS DETERMINED BY NEUTRON ACTIVATION ANALYSIS,
Interuniversitair Reactor Instituut, Delft (Netherlands).
J.J. M. DeGoey, J. P. W. Houtman, P. S. Tjioe, and J. H. Koeman.
Netherlands, Interuniversity Reactor Institute Report 133-72-04, 1972. 18 p, 10 fig, 3 tab, 11 ref.

Descriptors: *Pollutant identification, *Neutron activation analysis, *Mercury, *Chemical analysis, *Ecosystems, Marine fish, Analytical techniques, Water pollution sources.
Identifiers: Canned fish analysis.

Since 1967 Neutron Activation Analysis (N.A.A.) has been extensively applied in the Netherlands for investigating the distribution of mercury in water, plants, fish, birds, tissues of mammals, biological fluids, foodstuffs, industrial products and pharmaceuticals. The automated instrument can measure mercury concentration above 0.1 ppb in 90 samples per week. A number of analyses were made from canned fish originating from 18 different countries and sold on the Dutch market. For six types of fish the mercury contents varied between 0.004 and 0.08 ppm with average values between 0.01 and 0.067. For tuna samples concentrations ranged between 0.03 and 1.0 ppm of mercury with an average value of 0.39 ppm. Values of 0.25 ppm (average 0.056 ppm) were obtained from sardines. Additional measurement showed that about 80% of the mercury in all fish is present as methylmercury, which is considered to be lipophilic. However, in cod liver oil extremely low levels were found. This observation is in agreement with those made for fat of birds and seals. It seems possible that mercury is predominantly bound by the sulph-hydrl groups of the protein. (Woodard-USGS)
W73-05482

POTOMAC RIVER SEDIMENT STUDY,
Naval Ordnance Station, Indian Head, Md.
M. E. Houser, and M. I. Fauth.
Available from NTIS, Springfield, Va. 22151 as AD-744 955; Price $3.00 printed copy; 95 cents microfiche. Technical Report 355, June 1, 1972. 31 p, 22 fig, 9 tab, 5 ref.

Descriptors: *Water quality, *Sediments, *Chemical analysis, *Potomac River, *Estuaries, Water pollution sources, Heavy metals, Sampling, Analytical techniques, Spectrometers, Bottom sediments, Dredging.
Identifiers: *Naval Ordnance activities, *Indian Head (Md).

In order to evaluate the effect of the activities of the Naval Ordnance Station at Indian Head, Md., on the Potomac River Estuary, a study was made of the water and sediments of the lower river, particularly with reference to heavy metals. To determine if a seasonal effect existed, one set of samples was taken in August 1970 and another in December 1970. For sampling stations where marked differences in metals concentration occurred, a third series of samples was taken in April 1971. Potomac River sediments were analyzed for approximately 20 metals using atomic absorption spectrometry. Sample preparation involved extraction with water and nitric acid. The river area surveyed extended downstream from Key Bridge to Piney Point, a distance of 96 river miles. Data are presented for the following metals: aluminum, barium, cadmium, calcium, chromium, cobalt, copper, iron, lead, lithium, magnesium, manganese, mercury, nickel, potassium, silver, strontium, vanadium, and zinc. Lead content was highest at the Woodrow Wilson and Route 301 bridges. Copper, chromium, and nickel concentrations at Woodrow Wilson Bridge and Piscataway Creek appear to be associated with major waste treatment plants whose outfalls are in the vicinity. (Woodard-USGS)
W73-05483

A HYDROLOGIC DESCRIPTION OF LAKE THONOTOSASSA NEAR TAMPA, FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 07C.
W73-05486

VITAMIN B12, THIAMINE, AND BIOTIN CONTENTS OF MARINE PHYTOPLANKTON,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
A. F. Carlucci, and P. M. Bowes.
Journal of Phycology, Vol 8, No 2, p 133-137, June 1972. 6 tab, 26 ref.

Descriptors: *Phytoplankton, Sea water, Cultures, Nutrient requirements, Centrifugation, Filters, Filtration, Water pollution, Water pollution sources.
Identifiers: *Vitamin B12, *Thiamine, *Biotin, Skeletonema costatum, Stephanophyxis turris, Phaeodactylum tricornutum, Coccolithus huxleyi, Sample preparation, Biological samples.

An extraction procedure was developed for determining Vitamin B12, thiamine, and biotin contents of marine phytoplankton. Phytoplankters were collected either by centrifugation or by retention on a glass fiber filter, then heated at 100 C for 1 hr in 100 ml of acidified, vitamin-free seawater. The extract, after debris removal, was filter sterilized and analyzed with vitamin assay procedures. The vitamin contents of Phaeodactylum tricornutum, Skeletonema costatum, Stephanopyxis turris, and Coccolithus huxleyi were determined during growth in batch cultures. P. tricornutum (non-vitamin requirer) growing in aerated cultures contained 0.29-0.96 ng B12, 5-15 ng thiamine, and 0.45-1.70 ng biotin/mg C. Under similar conditions S. costatum (B12-requirer) contained about 0.06 ng B12, 5-36 ng thiamine, and 0.16-2.10 ng biotin/mg C. The Vitamin B12 content of S. costatum growing under nonaerated conditions decreased when medium B12 was reduced. The biotin content did not change when medium B12 was decreased. The thiamine content per unit weight of C. huxleyi (thiamine-requirer) growing with either 10 or 120 ng/liter thiamine decreased under both medium concentrations, indicating no net synthesis of the vitamin. (Byrd-Battelle)
W73-05498

BIOASSAY OF BIOTIN AND ITS DISTRIBUTION IN THE SEA,
Tokyo Univ. (Japan). Ocean Research Inst.
For primary bibliographic entry see Field 05A.
W73-05499

ANALYSIS OF A CHLORINATED TERPHENYL (AROCLOR 5460) AND ITS DEPOSITION IN TISSUES OF COD (GADUS MORHUA),
Bedford Inst., Dartmouth (Nova Scotia).
For primary bibliographic entry see Field 05A.
W73-05514

SEASONAL PATTERNS OF REPRODUCTION IN NEW YORK. POPULATIONS OF CODIUM FRAGILE (SUR.) HARIOT SUBSP. TOMENTOSOLDES (VAN GOOR) SILVA,
Adelphi Univ, Oakdale, N.Y. Inst. of Marine Science.
A. C. Churchill, and H. W. Moeller.
Journal of Phycology, Vol 8, No 2, p 147-152, June 1972. 6 fig, 20 ref.

Descriptors: *Marine algae, *Reproduction, *Chlorophyta, *New York, Seasonal, Temporal distribution, Water temperature, Cytological studies, Salinity, Sea water, Microscopy, Cultures, Light intensity.
Identifiers: *Codium fragile, Sample preservation.

Two populations of the green alga Codium fragile from Long Island were studied over a 2-year period. Collections were made at approximately monthly intervals from both populations. The plants were first characterized as first or second year by length measurements and samples were then examined microscopically to determine the nature and condition of reproductive structures. Other samples were desiccated for 1 hr at room temperature and then reimmersed in seawater to stimulate the release of reproductive cells. The size of released cells was measured and their viability determined by culturing for 72 hr at about 22C in a modified Erd-Schreiber medium under a 16 to 8 hr light-dark cycle. The relative abundance of reproductive studies was determined by cutting sections from branches, preserving them in formaldehyde, grinding in a Waring blender, and counting in a counting chamber. Reproduction was found to occur by formation of reproductive cells that germinated and developed asexually. There was a marked seasonal variation in the relative abundance of the reproductive organs on plants in both populations. A temperature below 12-15C apparently inhibits the initiation of reproductive organs. (Mortland-Battelle)
W73-05525

CHEMISTRY OF PESTICIDES,
Moscow State Univ. (USSR).
N. N. Melnikov.
Springer-Verlag, New York. 1971. 480 p.

Descriptors: *Pesticide toxicity, *Chemical degradation, *Chemical properties, *Physical properties, Carbamate pesticides, Chlorinated hydrocarbon pesticides, Metal organic pesticides, Organophosphorus pesticides, Phosphothioate pesticides, Phenolic pesticides, Urea pesticides, Aliphatic pesticides, Polychlorinated biphenyls, Thiocarbamate pesticides.

This volume represents a modern, concise summary of the basic principles of pest control by chemical means. Organization of the material is based on types of compounds rather than biological effectiveness, with emphasis on physical and chemical properties, synthesis of compounds and intermediates and toxicological properties. The different classes of compounds are described in separate chapters to present a logical sequence through the variations and derivatives of each chemical class. (Mackan-Battelle)
W73-05532

ON THE SORPTION OF MICROELEMENTS IN THE SEA WATER WITH ION-EXCHANGE RESIN (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Institut Okeanologii.
P. D. Novikov, M. U. Miropol'sky, and B. M. Talalaev.
Okeanologiya, Vol 12, No 1, p 161-167, January-February 1972. 3 fig, 2 tab.

Descriptors: *Trace elements, *Sorption, *Sea water, Ion exchange, Physical properties, Equipment, Permselective membranes, Selectivity.
Identifiers: *Ion exchange resins.

A description is given of the construction of a special sorption device, made wholly of polymeric material, meant for the studies of a selective sorption of microelements in the seawater. The sorption ability of industrial ion-exchange resin with respect to microelements of the natural seawater was studied. The greatest qualitative ability for sorption is shown to be typical of condensation type polyfunctional anionites. (Holoman-Battelle)
W73-05533

EFFECT OF TURBULENCE ON BOD TESTING,
Windsor Univ. (Ontario). Dept. of Civil Engineering.
For primary bibliographic entry see Field 05A.
W73-05553

CONTINUOUS PRODUCTION OF EXTRACELLULAR PROTEASE BY BACILLUS SUBTILIS IN A TWO-STAGE FERMENTOR,
Procter and Gamble Co., Cincinnati, Ohio. Miami Valley Labs.
D. E. Jensen.
Biotechnology and Bioengineering, Vol 14, No 4, p 647-662, July 1972. 6 fig, 1 tab, 43 ref.

Descriptors: *Growth chambers, *Growth rates, Laboratory equipment, Enzymes, Cultures, Aerobic bacteria, Assay, Electron microscopy, Dissolved oxygen, Protein, Methodology, Soil bacteria.
Identifiers: *Bacillus subtilis, Culturing vessels, *Protease, *Biosynthesis, *Continuous cultures, Heterotrophic bacteria, Bacterial physiology, Culture media, Substrate utilization, Growth media, Batch cultures, Ribonucleic acid, RNA, Metabolites.

Growth and protease production of Bacillus subtilis in semisynthetic and synthetic media were studied in batch culture and in a two-stage, laboratory scale, continuous fermentor. The amount of extracellular protease production was measured under specific growth conditions in both stages of the fermentor. At the dilution rates employed, the cells in the first stage of the fermentor produced negligible quantities of protease, and the culture primarily functioned as a continuous inoculum for the second stage of the fermentor. The culture effluent from the second stage of the fermentor contained extracellular protease, on the average, equal to 60 percent of the activity that had been found in the supernatant of a 48-hr batch culture grown in a medium having the same composition as that in the continuous fermentor. Extracellular protease was produced in semisynthetic medium by B. subtilis in the two-stage fermentor for as long as 26 days without culture degeneration. Additional studies indicated that continuous protease production could also be achieved in a synthetic medium. The RNA/protein ratios of cells grown in semisynthetic medium in batch culture and in each stage of the two-stage fermentor were examined. There was a positive correlation between the amount of protease produced by the cells and their RNA/protein ratio. Techniques employed for continuous production of protease by B. subtilis and the potential use of the method for investigating the control of secondary metabolite synthesis are discussed. (Holoman-Battelle)
W73-05555

FATE AND BEHAVIOR OF FIVE CHLORINATED HYDROCARBONS IN THREE NATURAL WATERS,
Simon Fraser Univ., Burnaby (British Columbia). Dept. of Biological Sciences.
P. C. Oloffs, L. J. Albright, and S. Y. Szeto.
Canadian Journal of Microbiology, Vol 18, No 9, p 1393-1398, September 1972. 5 tab, 13 ref.

Descriptors: *Chemical analysis, *Natural streams, *Water analysis, DDT, Water sampling, Polychlorinated biphenyls, Surfactants, Chlorinated hydrocarbon pesticides, Bodies of water, Water temperature, Water pollution sources, *Path of pollutants.
Identifiers: *Fate of pollutants, *Chlorinated hydrocarbons, Gas liquid chromatography, Lindane, Chlordane, Aroclor 1260, Fraser River, Nicomekl River, Georgia Strait.

Water samples removed from two rivers and from the subtidal zone of Georgia Strait in British Columbia were treated with either 0.025 ppm of DDT, lindane, alpha-chlordane, or gamma-chlordane, or 0.1 ppm Aroclor 1260 (PCB). The samples were incubated in the laboratory for up to 12 weeks at the temperatures of these natural waters at the time of sampling and the chlorinated hydrocarbons determined by gas-liquid chromatography and standard extraction techniques. Lindane persisted in all water samples throughout the experiment, but large proportions of the other compounds were transported into the atmosphere during incubation except when the containers were sealed. No metabolic breakdown could be demonstrated. As demonstrated with C-14-gamma-chlordane, uneven distribution of the pesticides occurred rapidly, but was prevented, or reversed, by addition of a surfactant to the water. Total bacterial counts were generally higher in treated than in untreated water samples. (Byrd-Battelle)
W73-05556

DIFFERENTIAL EFFECT OF CHLORAMPHENICOL AND ACTINOMYCIN D ON PROTEIN SYNTHESIS IN THE DECAPOD CRUSTACEAN UPOGEBIA LITORALIS,
Athens Univ. (Greece). Dept. of General Biology.
For primary bibliographic entry see Field 05C.
W73-05558

REARING AND MAINTENANCE OF PLECOPTERAN NYMPHS,
Waterloo Univ. (Ontario). Dept. of Biology.
For primary bibliographic entry see Field 07B.
W73-05561

UV IRRADIATION OF AROCLOR 1254,
Oregon State Univ., Corvallis. Dept. of Food Science and Technology.
For primary bibliographic entry see Field 05A.
W73-05566

FATE OF DDT IN SEVERN ESTUARY SEDIMENTS,
Bristol Univ. (England). School of Chemistry.
J. M. Hunter, M. M. Rhead, E. S. Albone, G. Eglinton, and N. C. Evans.
Environmental Science and Technology, Vol 6, No 10, p 914-919, October 1972. 1 fig, 5 tab, 33 ref.

Descriptors: *DDT, *Biodegradation, *Sediments, Activated sludge, *DDD, *Radioactivity techniques, *Gas chromatography, Degradation (Decomposition), Estuaries, Sewage bacteria, Tracers, Incubation, Separation techniques, Water pollution effects, Sewage treatment, Path of pollutants.
Identifiers: Sample preparation, *Fate of pollutants, p p' DDT, p p' DDD, C-14, Electron capture gas chromatography, Mass spectrometry, Thin layer chromatography, Radioscanning, Autoradiography, Metabolites.

The functions of estuarine sediments as pollutant sink and as pollutant bank are assessed in relation to the fate of DDT in the environment. Carbon-14 labeled p,p'-DDT was exposed to estuarine mud in situ and in the laboratory and to anaerobic sewage sludge. After incubation, samples were extracted and analyzed by scintillation counts, electron capture gas chromatography, thin-layer chromatography, gc-mass spectrometry, and autoradiography or radioscanning to determine ratios of DDT to DDD. The determinations show that p,p'-DDT was degraded more slowly when incorporated in situ in Severn estuary sediments than when incubated in sediment samples maintained under hydrogen in the laboratory. These transformations are compared with the more extensive degradation of DDT on incubation in anaerobic sewage sludge. In all incubations, metabolites included p,p'-DDD. The wider application of the techniques developed is discussed. (Little-Battelle)
W73-05569

POLYCHLORINATED BIPHENYL RESIDUES: ACCUMULATION IN CAYUGA LAKE TROUT WITH AGE,
Cornell Univ., Ithaca, N.Y. Pesticide Residue Lab.
C. A. Bache, J. W. Serum, W. D. Youngs, and D. J. Lisk.
Science, Vol 177, No 4055, p 1191-1192, September 29, 1972. 1 tab, 6 ref.

Descriptors: *Polychlorinated biphenyls, *Lake trout, *Growth stages, *Mass spectrometry, *Pollutant identification, Separation techniques, Solvent extractions, Gas chromatography, Freshwater fish, Water pollution effects, Cold-water fish.
Identifiers: *Bioaccumulation, *Cayuga Lake, *Electron capture gas chromatography, Chlorinated hydrocarbons, Column chromatography, Biological magnification, Sample preparation, Sensitivity, Detection limits, p p' DDE, Mass spectra.

Trout were taken from Cayuga Lake, Ithaca, New York in October, 1970 and analyzed for the presence of PCB's. The fish were mechanically chopped, ground, and thoroughly mixed without evisceration and samples were dried and extracted with hexane for 3 hr. The extracts were concentrated and the PCB's separated from DDT residues and other constituents using sulfuric acid partitioning and column chromatography on silica gel. Analysis was made by electron capture gas chromatography; the concentration was estimated by the method of Risebrough in which the response of each PCB isomer is taken as equal to that of the corresponding weight of p,p'-DDE. Combined gas chromatography-mass spectrometry was used to verify the presence of various PCB isomers in a 12-yr old lake trout. The method described above was sensitive to about 0.25 ppm of PCB's. PCB concentration was shown to progressively increase with maturity. That there exists a relationship between fish age and PCB concentrations was highly significant. (Holoman-Battelle)
W73-05571

NITROGEN SUPERSATURATION--COLUMBIA AND SNAKE RIVERS--STATE OF WASHINGTON.
For primary bibliographic entry see Field 06E.
W73-05594

CONFERENCE IN THE MATTER OF POLLUTION OF THE NAVIGABLE WATERS OF BISCAYNE BAY AND ITS TRIBUTARIES IN THE STATE OF FLORIDA.
Federal Water Pollution Control Administration, Washington, D.C.
For primary bibliographic entry see Field 05C.
W73-05615

CALCIUM AND PHOSPHORUS CONTENT IN THE BODIES OF UKRAINIAN CARP DURING COMMUNAL CULTIVATION (IN RUSSIAN),
M. N. Balashova.
Rybn Khoz Resp Mezhved Temat Nauchn Sb. 12. p 43-45. 1971.
Identifiers: *Calcium, *Carp, Communal, Cultivation, *Phosphorus, Ukrainian, USSR.

Results of biochemical studies of the edible tissues of Ukrainian varieties of carp during communal cultivation are given. The work was done in the Donrybkombinate in the steppe zone of the Ukrainian SSR. A gradual age-related increase in the Ca content and age-related decrease in P content was noted. Some seasonal changes in quantitative indices of general ash and Ca in carp bodies was observed.–Copyright 1972, Biological Abstracts, Inc.
W73-05629

CADMIUM, CHROMIUM, LEAD, MERCURY: A PLENARY ACCOUNT FOR WATER POLLUTION, PART 2-REMOVAL TECHNIQUES,
For primary bibliographic entry see Field 05D.
W73-05634

STUDIES ON PREDOMINATION OF SELECTED BACTERIA OF SEWAGE ORIGIN,
Oklahoma State Univ., Stillwater.
D. E. Modesitt.
Available from University Microfilms, 300 N. Zeeb Rd., Ann Arbor, Mich. 48106 Order No. 71-11,230. Ph. D. Disseration, 1970, 183 p.

Descriptors: *Bacteria, *Sewage, *Nutrient requirements, Population, Cultures, Sewage, Bacteria, Waste treatment, Water pollution.
Identifiers: *Nutrient agar, Population density, Sewage agar.

A medium prepared from a sewage concentrate was compared with nutrient agar for the enumeration and differentiation of bacterial colonies from sewage. Determinations were made on weekly sewage samples for temperature, bacterial population density, and the predominate type of bacterial colony. Of the 18 predominate culture types isolated, four were selected for further study as pure and mixed culture populations. Growth rate determinations were made for each of the four selected cultures in both media. A 30-fold concentration of the sewage was needed to provide the substrate concentration necessary for sufficient colony development, and the addition of phosphate buffer, mineral salts, and ammonium sulfate to the concentrated sewage was required to obtain higher colony counts. Comparison of sewage agar and nutrient agar showed that the latter gave greater colony counts and may be more acceptable due to its uniformity and ease of preparation. Most of the isolated cultures grew well on a supplemental glucose minimal medium. Due to interaction among the species, pure culture studies could not reveal the associative effects observed in mixed culture studies. (Murphy-Texas)
W73-05660

THEORETICAL STUDY OF DISPERSION IN A FRACTURED ROCK AQUIFER,
Northwestern Univ., Evanston, Ill. Technological Inst.
R. J. Krizek, E. Castillo, and G. M. Karadi.
Journal of Geophysical Research, Vol.78, No 3, p 558-573, January 20, 1973. 12 fig, 7 ref.

Descriptors: *Dispersion, *Groundwater movement, *Joints (Geologic), *Path of pollutants, *Fracture permeability, Hydrogeology, Aquifer characteristics, Injection wells, Waste disposal wells, Mixing, Waste water disposal, Mathematical models, Fractures (Geologic), Malencleves.

The hydrodynamic dispersion of a contaminant within the joint network of a horizontally oriented, fractured rock aquifer confined at the top and bottom by two aquicludes is described by a mathematical model. The contaminant is introduced into the joint system along a vertical line, which simulates a well, and the time-dependent propagation of equiconcentration contours is determined. The independent variables include flow regime (laminar or turbulent), degree of mixing that occurs at a node, joint orientations, and injection well pressure. When compared at a given time factor (actual time divided by some characteristic time), the dispersion phenomenon is significantly affected by the orientation of the joints, the injection pressure at the well, and the steady state flow velocities in the rock joints. Neither the type of flow (laminar or turbulent) nor the degree of mixing at a node exerts a strong influence. (Knapp-USGS)
W73-05675

ORGANIC CARBON IN SEDIMENTS OF LAKE GEORGE, NEW YORK: RELATION TO MORPHOLOGY OF LAKE BOTTOM, GRAIN SIZE OF SEDIMENTS, AND MAN'S ACTIVITIES,
Rensselaer Polytechnic Inst., Troy, N.Y. Lake George Water Research Center.
For primary bibliographic entry see Field 02H.
W73-05681

AIR POLLUTION: OUR ECOLOGICAL ALARM AND BLESSING IN DISGUISE,
California Univ., Livermore. Lawrence Livermore Lab.
For primary bibliographic entry see Field 05C.
W73-05695

DISTRIBUTION OF SOME TRACE ELEMENTS IN JURASSIC SEDIMENTS OF THE DNIEPER-DONETS BASIN (O RASPREDELENII NEKOTORYKH MALYKH ELEMENTOV V YURSKIKH OTLOZHENIYAKH DNEPROVSKO-DONETSKOY VPADINY),
For primary bibliographic entry see Field 02J.
W73-05700

CANALS OFFER VAST COOLING POTENTIAL.

Environmental Science and Technology, Vol 4, No 4, p 287, April 1970.

Descriptors: *Electric power production, *Electric powerplants, *Thermal pollution, Nuclear powerplants, Thermal powerplants, Water cooling.

As the need for more electrical power arise, the nation looks more to stream generation methods. The main drawback is how to handle the waste heat produced. One relatively new idea is the use of canals. Transportation, irrigation and water supply canals can be used as a great heat sink. Strict controls would have to be followed, but the potential is enormous. The idea is still in the planning stages, but is being considered. (Skogerboe-Colorado State)
W73-05725

VARIABLES AFFECTING A VALUES AS A MEASURE OF SOIL NITROGEN AVAILABILITY,
California Univ., Davis. Dept. of Soils and Plant Nutrition.
For primary bibliographic entry see Field 02G.
W73-05735

DETERMINATION OF OXIDATION-REDUCTION POTENTIAL OF MUDDY SEDIMENTS IN ADOIKE POND, (IN JAPANESE),
Kagawa Univ., Takamatsu (Japan). Dept. of Agricultural Chemistry.
T. Tamaki, and Y. Yumeda.
Kagawa Daigaku Nogakubu Gakuzyutu Hokoku. Vol 23, No 1, p 84-91, 1971, Illus, English summary.
Identifiers: Adoike pond, Determination, Fish, Japan, Nursery, *Oxidation-reduction potential, Pond, *Sediments (Mud).

Adoike-pond in Hiketa-cho, Kagawa-ken, Japan, is used as a fish nursery. Determinations of pH values, oxidation-reduction potentials and specific electric conductivities of muddy sediments were performed in situ from 1968 to 1969 at 9 observation stations. The pH value of the muddy sediments was related to pond water which lies on the muddy sediments. Oxidation-reduction potentials of the muddy sediments were markedly reduced in summer. The specific electrical conductivities of the muddy sediments were lower than that of pond water. The degenerative process on fish production by the deposition of the muddy sediments in this pond increases yearly and the muddy sediments are deposited mainly by organic deposit forming processes of the food residues given to the fish. Laboratory experiments showed that the addition of iron sands to the muddy sediments increased the oxidative condition of the muddy sediments. This is one of the favorable methods for the amelioration of the reduced muddy sediments.–Copyright 1972, Biological Abstracts, Inc.
W73-05737

CONDUCTIVITY MEASUREMENTS MONITOR WASTE STREAMS,
Tennessee Valley Authority, Muscle Shoals, Ala.
For primary bibliographic entry see Field 05A.
W73-05739

INFLUENCE OF NUTRIENT POLLUTION LEVLES UPON ELEMENT CONSTITUION AND MORPHOLOGY OF ELODEA CANADENSIS RICH. IN MICHX,
Pennsylvania State Univ., University Park. Dept. of Biology.
For primary bibliographic entry see Field 05C.
W73-05747

NEW RADIOTRACER TECHIQUE INVOLVING 14C AND 51CR, FOR ESTIMATING THE ASSIMILATION EFFICIENCIES OF AQUATIC, PRIMARY CONSUMERS,
Leeds Univ. (England). Dept. of Zoology.
For primary bibliographic entry see Field 05A.
W73-05766

WATER SOLUBLE ORGANIC SUBSTANCES LEACHABLE FROM FEEDLOT MANURE,
Agricultural Research Service, Fort Collins, Colo.
A. R. Mosier, K. Haider, and F. E.Clark.
Journal of Environmental Quality, Vol 1, No 3, p320-322, July-Sept., 1972. 3 tab, 17 ref.

Descriptors: *Leaching, *Organic matter, *Feed lots, *Fertilizers, *Eutrophication, Environmental effects, Leachate, Solubility, Seepage, Lakes, Streams, Oxygen demand, Taste, Odor, Algae, Biota, Groundwater, Water quality, Phenols, Soils, Polymers, Degradation (Decomposition), Grasslands, Water pollution sources, Water pollution effects, *Colorado, Farm wastes.
Identifiers: *Manure.

Feedlot seepages may contribute to organic and mineral enrichment of lakes and streams to produce high oxygen demand, bad tastes and odors, algal growth and other biotic effects. The water-soluble organic material of feedlot manure and soil was compared with organic materials found in leachates of grassland soil and groundwater in the vicinity of and remote from feedlots. Water extracts of manure and soil were compared with water from shallow wells. Thin-layer and column chromatography failed to reveal water-soluble organics unique to feedlot groundwaters. Free phenolics could readily be leached from manure and from upper centimeters of feedlot soil, but only trace amounts of low-molecular-weight organics were found in groundwater samples. Polymerized materials were the major organic constituents in all groundwater examined. Mildly reductive degradation of organic polymers

in leachates from feedlot manure and soil, and grassland soil yielded identifiable phenolics. No phenolics were found in groundwaters. There is no uniform or continuing movement of organic material from feedlots through the soil profile to the groundwater under the feedlot sites studied in the middle South Plattee River basin area of Colorado. (Popkin-Arizona)
W73-05783

HYDROGEOLOGIC EVALUATION OF A SANITARY LANDFILL IN PORTAGE COUNTY, OHIO,
Kent State Univ., Ohio. Dept. of Geology.
R. D. Buller.
The Compass of Sigma Gamma Epsilon, Vol 48, No 2, p 84-90, January, 1971. 5 fig, 1 tab, 7 ref.

Descriptors: *Landfills, *Water pollution control, Sanitary engineering, Garbage dumps, Hydrogeology, *Ohio, Path of pollutants.
Identifiers: *Portage County (Ohio).

A sanitary landfill site in eastern Rootstown Township, Portage County, Ohio was studied to determine whether hydrogeologic factors at the site facilitate or prevent the contamination of potentially usable water sources. This study deals directly with the effect of chemical contaminants on the quality of surface waters and indirectly with subsurface waters. An evaluation of this landfill with respect to water pollution potential was based on the results of water sample analyses and observation of the effects of site engineering designed to avoid water pollution problems. Steps taken to prevent surface and groundwater contamination seem to be working effectively at this landfill. With interceptor ditches, impermeable banks and a seal underneath, very little leachate can escape to pollute the surrounding environment. As long as the banks are maintained and the ditches kept clear no major problems should arise. This landfill should be rated highly from a hydrogeological standpoint and with a minimal amount of effort could continue to be one of the best sanitary landfills in the Portage County area. (Knapp-USGS)
W73-05790

AGRICULTURAL RUNOFF--CHARACTERISTICS AND CONTROL,
Cornell Univ., Ithaca, N.Y. Dept. of Civil and Agricultural Engineering.
R. C. Loehr.
Journal of the Sanitary Engineering Division, American Society of Civil Engineers, Vol 98, No SA6, Paper 9406, p 909-925, December, 1972. 1 tab, 30 ref.

Descriptors: *Water pollution sources, *Farm wastes, *Water pollution control, Confinement pens, Feed lots, Fertilizers, Runoff.

Agricultural runoff consists of nonpoint sources that range from almost natural runoff to that from concentrated agricultural operations such as animal feedlots and fertilized fields. Control of pollution is possible by waste management and land conservation techniques. Increases in agricultural efficiency have been associated with a variety of potential and real environmental problems. Some pollution problems of agricultural runoff are quantified and discussed. The discussion includes erosion, animal feedlots; rural runoff, pollution characteristics, and effects of fertilizers. Management methods to control the quantity and pollutional quality of the runoff are noted. Agriculture should institute a systematic, coordinated approach for specific production operations to reduce excesses that could cause environmental degradation. (Knapp-USGS)
W73-05794

CARBONIC ANHYDRASE INTERACTION WITH DDT, DDE, AND DIELDRIN,
Washington Univ., Seattle. Dept. of Chemistry.
Y. Pocker, W. M. Beug, and V. R. Ainardi.
Science, Vol 174, No 4016, p 1336-1339, December 24, 1971. 1 fig, 1 tab, 17 ref. NIH Grant AM 09221, PHS Grant GM 39680

Descriptors: *Insecticides, *Carbon dioxide, *Chemical reactions, Solubility, Water chemistry, Biochemistry, Enzymes, *DDT, *DDE, *Dieldrin, Pollutants.

The transfer of carbon dioxide from one part of the organism to another is ofter limited by the rate of hydration of carbon dioxide to form bicarbonate ion, and by the reverse process of dehydration of the latter substance. The active site of various carbonic anhydrases is not blocked by DDT, DDE, or dieldrin. Impairment of catalytic efficiency can only be documented in opalescent test solutions in which the insecticides are present in excess of their solubility limit. These slowly forming precipitates occlude enzyme from solution and furnish a physical explanation of the supposed inhibition. The amounts occluded depend, among other things, on the conformational and topographical characteristics of the particular carbonic anhydrase molecules. (Woodard-USGS)
W73-05797

OCCURRENCE OF SHALLOW SALTY GROUND WATER IN SELECTED AREAS OF WEST VIRGINIA,
Federal Water Pollution Control Administration, Wheeling, W. Va. Ohio Basin Regin.
B. M. Wilmoth.
Proceedings of the West Virginia Academy of Science, Vol 42, p 202-208, 1970. 5 fig, 4 ref.

Descriptors: *Saline water intrusion, *West Virginia, *Groundwater movement, Brines, Hydrogeology, Water pollution sources, Water quality, Water chemistry, Saline water, Connate water, Encroachment.

Salt water is migrating into fresh groundwater aquifers in many places of the western half of West Virginia. Because of the wide distribution of salty groundwater and connate brine at various depths in the area it is difficult to determine how much of the contamination is natural and how much is the result of subsurface industrial activities. Natural salt water springs in Kanawha County were used by the Indians and early pioneer settlers, and the available historical information indicates no regional variations in salt content of groundwater during the period of record. Salt water can migrate into the rocks immediately below fresh water zones and still pose no problem for shallow water wells pumped at low rates. Records at several water well developments show increases in salt content from various industrial activities. Brine under natural artesian pressure flowed up an abandoned open borehole and contaminated a fresh water aquifer in Fayette County. Subsurface injection of waste oil-field brine contaminated shallow fresh groundwater in Roane County. Overdevelopment of fresh groundwater at Charleston, Kanawha County, excessively lowered water levels and artificially induced migration of salt water into fresh water zones. (Knapp-USGS)
W73-05800

A SELECT BIBLIOGRAPHY ON POLLUTION OF ESTUARIES AND COASTAL WATERS WITH PARTICULAR REGARD TO INDUSTRIAL EFFLUENTS,
British Iron and Steel Research Association, London (England). Strip Mills Div.
D. G. Brinn.
Available from NTIS, Springfield, Va 22151 as PB-212 215 Price $3.00 printed copy; 95 cents microfiche. Bibliography SM/BIB/785, August 1972. 3 p, 34 ref.

Descriptors: *Bibliographies, *Water pollution sources, *Estuaries, *Coasts, *Industrial wastes, Abstracts, Publications, Environmental effects, Ecology, Eutrophication, Foreign countries, United States, Asia, Europe.
Identifiers: *England.

This annotated bibliography on water pollution in estuaries and coastal waters includes 34 references, divided into 5 sections: general papers, ecological considerations, eutrophication and nutrient cycles, investigations in United Kingdom locations, and investigations in foreign locations. Emphasis is on industrial wastes. (Woodard-USGS)
W73-05805

SYSTEM SIMULATION TO TEST ENVIRONMENTAL POLICY: DDT,
Alfred P. Sloan School of Management, Cambridge, Mass.
J. Randers.
International Journal of Environmental Studies, Vol 4, No 1, p 51-61, November, 1972, 4 fig, 1 tab, 30 ref.

Descriptors: *Simulation analysis, Water quality, Computers, *Decision making, *Estimating, *DDT, Effects, Movement, Abatement, Ecosystems, Fish, Systems analysis, Mathematical models, Alternatives, Rivers, Oceans.
Identifiers: *Policy makers, Global environment, *Systems dynamics, Non-linear systems.

An example shows how policy makers can use system simulation to arrive at conclusions about the future consequences of current actions even in the case where complete information about the system is not available. Systems dynamics, a computer-based simulation methodology useful in the analysis of the time behavior complex nonlinear systems is used to illuminate an ecological problem with immediate implications--the distribution of insecticide DDT in the global environment. The results suggest that even if DDT usage were stabilized or decreased in 1972, the concentration of DDT in fish would continue to rise for another two to fifty years, depending upon the specific form of DDT abatement policy. Systems dynamics modelling techniques do not permit prediction of the future; they are, however, extremely useful for identification of those parameters and structural relationships whose precise values are of critical importance to decision makers. (Bell-Cornell)
W73-05817

NITRATE CONCENTRATIONS IN GROUNDWATER BENEATH A BEEF CATTLE FEEDLOT,
Agricultural Research Service, Gunnison, Colo. Soil and Water Conservation Research Div.
J. C. Lorimor, L. N. Mielke, L. F. Elliott, and J. R. Ellis.
Water Resources Bulletin, Vol. 8, No. 5, p 999-1005, October, 1972. 4 fig, 3 tab, 6 ref.

Descriptors: Groundwater, Groundwater movement, Aquifer characteristics, Nitrogen, *Nitrates, Piezometers, *Water sampling, Irrigation, Cattle, *Feed lots, Dyes, Tracers, Transmissivity, Hydraulic gradient.
Identifiers: Nitrate-Nitrogen.

In June 1970, a ground water sampling study was conducted in conjunction with initiation of irrigation pumping from ground water near a feed lot located in east-central Nebraska. Aquifer characteristics and nitrate-nitrogen concentrations in the water were determined. A dye injected into the water showed that water from beneath the feedlot was being sampled at the wells immediately outside the lot. Ground water nitrate levels were generally lower down-gradient from the feedlot than they were up-gradient. Nitrate levels in the well samples were not changed significantly by the start of irrigation pumping, although they did ap-

pear to increase slightly. Piezometer samples did show a significant difference. Except for two samples obtained during the pumping trial, nitrate-nitrogen was well below the Public Health Service limit of 10 parts per million. (Campbell-NWWA)
W73-05823

WATER PROBLEMS ASSOCIATED WITH OIL PRODUCTION IN ALABAMA,
Geological Survey of Alabama, Montgomery.
W. J. Powell, L. E. Carroon, and J. R. Avrett.
Geological Survey of Alabama Circular 22 1963. 63 p, 17 fig, 15 tab, 12 ref.

Descriptors: Oil industry, Brines, *Brine disposal, *Pollution abatement, Groundwater, *Hydrologic systems, Groundwater movement, Wells, Water quality, *Alabama, Chlorides, *Leakage, Pipelines, Waste disposal.
Identifiers: Pit disposal, Contamination, Well heads, *Brine-storage pits.

Contamination of fresh water supplies associated with the disposal of brines is a problem in the Pollard, Gilbertown, Citronelle, and South Carlton oil fields. The two major sources of contamination are 1) disposal pits underlain by permeable sands, and 2) leaks from pipelines and well heads that allow brines to percolate downward to the ground water aquifer. The areal extent of the contamination in each of the oil fields has been defined in general terms. Each field is discussed separately, in the order of apparent seriousness of its present and future problems. Gas fields in the State are of very limited areal extent, and the problems involved in developing have been negligible. As future gas development within these areas appears remote, these fields have not been considered under the scope of this study. (Smith-NWWA)
W73-05826

EFFECTS OF STEEL WORKS EFFLUENTS,
University of Strathclyde, Garelochhead (Scotland). Marine Lab.
For primary bibliographic entry see Field 05C.
W73-05836

A STUDY OF STRONTIUM, MAGNESIUM, AND CALCIUM IN THE ENVIRONMENT AND EXOSKELETON OF DECAPOD CRUSTACEANS, WITH SPECIAL REFERENCE TO UCA BURGERSI ON BARBUDA, WEST INDIES,
Marine Biological Association of the United Kingdom, Plymouth (England).
P. E. Gibbs, and G. W. Bryan.
Journal of Experimental Marine Biology and Ecology, Vol 9, No 1, p 97-110, June 1972. 5 fig, 4 tab, 39 ref.

Descriptors: *Crustaceans, *Magnesium, *Calcium, *Strontium, *Chemical analysis, *Water analysis, Brackish water, Sea water, Pollutant identification, Water sampling, Heavy metals, Marine animals, Alkaline earth metals, Swamps, Lagoons, Volumetric analysis, Crabs, Analytical techniques, Invertebrates, Shellfish, Metals, Environment, Sampling, Saline water, Spectrometers.
Identifiers: *Decapods, *Uca burgersi, *Exoskeleton, *Carcinus maenas, Sample preparation, Fiddler crabs, Barbuda, European shore crab, Macroinvertebrates, *West Indies, Leeward Islands, Brachyura, Grapsus grapsus, Geograpsus lividus, Cardisoma guanhumi, Ocypode quadrata, Gecarcinus lateralis, Chlorinity, Chemical digestion, Atomic absorption spectrophotometry, Flame emission spectroscopy.

Strontium, magnesium, and calcium in the environment and exoskeleton of brachyuran decapod crustaceans were studied, with special reference to the fiddler crab, Uca burgersi. An experimental investigation of the strontium/calcium atom ratio of the exoskeletons of the European shore crab, Carcinus maenas, and other Barbuda and Plymouth crabs was carried out as an extension of the study. Duplicate water and crab samples were collected at 10 stations around Barbuda and chlorinity was determined by the silver nitrate titration method, magnesium and calcium by atomic absorption spectrometry, and strontium by flame emission spectrometry. In the extension study, two experimental seawaters were tested: one in which the strontium concentration was raised to twice that of normal seawater, and the other to 5 times the normal value. Sr and Ca in the exoskeletons of the specimens were determined as described for the Barbuda samples and the results used to calculate strontium/calcium atom ratios. Analyses of samples from Barbuda, Leeward Islands, show that the strontium/calcium atom ratio of the exoskeleton of the fiddler crab is proportional to that of the environment, whilst the atom ratio magnesium/calcium of the exoskeleton is fairly constant regardless of the environmental ratio. Laboratory experiments on Carbinus maenas (L.) demonstrate that the strontium/calcium atom ratio of the exoskeleton is, to a large extent, determined by the ratio in the environment at the time of the deposition of the new exoskeleton. Most brachyuran crabs have similar distribution coefficients and major variations in the strontium/calcium atom ratio can be related to difference in the environmental ratio. (Byrd-Battelle)
W73-05841

CONTAMINATION OF FRESH VEGETABLES AND CANAL WATER WITH SEWAGE IN CAIRO AREA,
Ain-Shams Univ., Cairo (Egypt). Faculty of Agriculture.
S. M. Taha, S. A. Z. Mahmoud, Y. Z. Ishac, and A. H. Taha.
Journal of Microbiology U.A.R., Vol 3, No 2, p 177-184, 1968. 3 tab, 18 ref.

Descriptors: *Vegetables crops, Water pollution effects, *Canals, *Sewage, *Enteric bacteria, Pathogenic bacteria, Public health, Freshwater, Cultures, Pollutant identification, Water pollution sources, Bioindicators.
Identifiers: *Cairo, Streptococcus faecalis, Clostridium welchii, Clostridium tetani, Salmonella typhosum, Lactose broth, Dilution frequency method.

The contamination of fresh vegetables and canal water with sewage in the Cairo area was investigated by estimating the numbers of coliforms, fecal streptococci, and Clostridium welchii which are naturally present in fecal materials. Samples of fresh vegetables from the fields not washed in canal waters, vegetables samples washed in canal waters, and canal water samples were collected. Lactose broth was used for the determination of Streptococcus faecalis and Clostridium welchii. Testing vegetables collected from various parts in Cairo area revealed: Untreated vegetables taken directly from the field were slightly contaminated with intestinal bacteria. They were less contaminated than those washed with canal water. Testing canal water itself showed that it was highly polluted. All vegetables samples ready for consumption in Cairo districts were found to be highly polluted. Bacteriological analysis showed the presence of fecal coliforms, Str. faecalis and C. welchii, pollution indicators. (Byrd-Battelle)
W73-05842

CONCENTRATION AND ESTIMATION OF 14 POLYCYCLIC AROMATIC HYDROCARBONS AT LOW LEVELS IN HIGH-PROTEIN FOODS, OILS, AND FATS,
For primary bibliographic entry see Field 05A.
W73-05850

5C. Effects of Pollution

UPTAKE OF TOXIC WATER POLLUTANTS (PCB) BY LAKE TROUT,
Northern Michigan Univ., Marquette. Dept. of Biology.
R. Parejko, and R. Johnston.
Available from the National Technical Information Service as PB-214 768, $3.00 in paper copy, $0.95 in microfiche. Michigan Institute of Water Research Project Completion Report January 1973, 16p, 3 tab. OWRR A-061-MICH (1). 14-01-0001-3522.

Descriptors: *Polychlorinated biphenyls, *Lake Superior, *Lake trout, Trophic level, Chlorinated hydrocarbon pesticides, *Path of pollutants.

Lake trout taken from North America's largest oligotrophic lake, Lake Superior, were analyzed to determine the content of polychlorinated biphenyls (PCBs) in their tissue. Lake trout should contain relatively high concentrations of chlorinated hydrocarbon compounds (that like the PCBs, tend to be nonbiodegradable) as they are at a high trophic level within the lake and thus should accumulate these biologically magnified compounds. These fish are also used for human consumption and the potential contamination of humans with PCBs would exist if fish that contained these compounds would be consumed. Results from analysis of fish oil extracted from lake trout have demonstrated that these fish possess low but detectable concentrations of PCBs in their tissue. Some of the lake trout analyzed also contained significant concentrations of chlorinated pesticides such as DDT and/or its analogs. Of the PCBs (identified as Aroclors--a trade name for industrial mixtures of PCBs) found in Lake Superior lake trout, the biphenyls containing lower percent concentrations of chlorine predominated. Statistical determinations made between mean PCB concentration and fish age, sex and geographical location of removal from Lake Superior indicated that no correlation could be found between PCB concentration and any of the comparative parameters. However, only a small sample size was used in making these statistical studies.
W73-05201

EFFECT OF WATER QUALITY ON FIRST-YEAR MORTALITY OF LARGEMOUTH BASS,
Cornell Univ., Ithaca, N.Y. Water Resources and Marine Sciences Center.
C. A. Carlson, A. W. Eipper, and J. L. Forney.
Available from the National Technical Information Service as PB-214 769, $3.00 in paper copy, $0.95 in microfiche. Water Resources and Marine Sciences Center Technical Report No. 45, 1972. 8 p, 35 ref. OWRR A-013-NY (4). 14-01-0001-927, 1400, 1852, 14-31-0001-3032.

Descriptors: *Bass, *Marking techniques, *Mortality, *Oxygen, *Temperature, *Thermal pollution, *Water quality, Fish behavior, Dyes, Ecology, Fish diets, Larvae, Crustaceans, Radioisotopes.
Identifiers: Bioenergetics.

Much additional information on causes of early mortality of game fish is necessary for effective fish management and establishment of water quality standards for protection of important fish species. Research has been directed primarily toward determining mechanisms responsible for first-year mortality of largemouth bass (Micropterus salmoids) and developing technology needed to quantify their significance. Specific studies have included: (1) research on methods of marking and sampling small fish to permit identification of individuals and estimates of population size and survival; (2) controlled laboratory studies on the effects of incubation temperature on the survival of

largemouth bass embryos; (3) investigations of the food, feeding habits, and bioenergetics of bass larvae; (4) studies of the interacting effects of dissolved oxygen concentration and fanning on the survival of largemouth bass embryos; (5) evaluation of predation as a source of mortality of embryos and larval bass, and (6) research on development of a natural or artificial food source for larval bass in laboratory experiments. Results of these are summarized. Several publications and reports on this research, and on the related issue of the ecological consequences of nuclear power plants, are listed. (Carlson, Eipper and Forney-Cornell)
W73-05203

MICROBIOLOGICAL FORMATION OF POTENTIALLY HAZARDOUS ORGANO--METAL COMPOUNDS IN WATER,
Cornell Univ., Ithaca, N.Y. Water Resources and Marine Sciences Center.
For primary bibliographic entry see Field 05B.
W73-05206

ANTAGONISTIC RELATIONSHIP OF SOME FUNGI (FUNGI IMPERFECTI) TOWARDS PATHOGENIC BACTERIA IN THE STAVNJA RIVER (IN SERBO-CROATRAN),
Sarajevo Univ. (Yugoslavia). Bioloski Institut.
B. Ristanovic, and M. Psorn.
Acta Biol jugosl Ser B Mikrobiol. Vol 7, ref 2, p 163-171. 1970. English summary.
Identifiers: Bacteria, *Fungi imperfecti, Pathogenic bacteria, Rivers, *Stavnja River, Yugoslavia.

Numerous fungi present in nutrient media where mixed microbial populations developed, had an inhibitory effect towards saprophytic bacteria and fungi. Strains of these antagonists were used in order to investigate their activity towards bacteria which could be found in water and which are the agents of different diseases in man.--Copyright 1972, Biological Abstracts, Inc.
W73-05219

CALCIUM OXALATE CRYSTALS IN THE ARAGONITE-PRODUCING GREEN ALGA PENICILLUS AND RELATED GENERA,
Florida State Univ., Tallahassee. Dept. of Biological Science.
E. I. Friedmann, W. C. Roth, J. B. Turner, and R. S. McEwen.
Science, Vol 177, No 4052, p 891-893, September 8, 1972. 1 fig, 1 tab, 9 ref.

Descriptors: *Chlorophyta, *Crystals, *Marine algae, Sedimentation, X-ray diffraction, Electron microscopy, Crystallography, Hydrates.
Identifiers: *Calcium oxalate, *Aragonite, *Marine sediments, Sample preparation, Light microscopy, Calcification, Penicillus dumetosus, Pencillus capitatus, Penicillus pyriformis, Penicillus lamouroxii, Rhipocephalus oblongus, Rhipocephalus phoenix, Udotea conglutinata, Avrainvillea nigricans, Avrainvillea longicaulis, Arainvillea levis, Cladocepalus luteofuscus.

Calcium oxalate crystals occur in the marine green algae Penicillus, Rhipocephalus, and Udotea, known as producers of sedimentary aragonite needies. In contrast to the externally deposited aragonite crystals which are generally less than 15 micrometers long, the oxalate crystals are larger (up to 150 micrometers) and are located in the vacuolar system of the plant. Under the light microscope the crystals appear as single acicular structures. In the transmission electron microscope the crystals appear to be encased in a chamberlike structure within the granular vacuolar material. Their appearance is similar to the electron microscopic image of calcium oxalate crystals in higher plants. For x-ray diffraction analysis the intracellular crystals were isolated from specimens of P. dumetosus, collected in the Florida Bay, by dissolution of the aragonite sheath in warm 65 percent acetic acid and subsequent digestion of the organic matter in 5.25 percent commercial sodium hypochlorite solution at 70C. The acetone-washed and dried sample was mounted in a Lindemann glass capillary and photographed with Ni-filtered CuK sub alpha radiation in a Debye-Scherrer powder camera of 57.3 mm radius. The diffraction pattern corresponds to that of one of the tetragonal monohydrates reported in the powder diffraction file of the American Society for Testing and Materials. No calcium oxalate was found in the related but noncalcifying genera Avrainvillea and Cladocephalus. (Holoman-Battelle)
W73-05254

AN OBLIGATELY AUTHOTROPHIC MUTANT OF CHLAMYDOMONAS DYSOSMOS: A BIOCHEMICAL ELUCIDATION,
For primary bibliographic entry see Field 05B.
W73-05264

THE PHYSIOLOGICAL ROLE OF TETRATHIONATE RESPIRATION IN GROWING CITROBACTER,
Karlova Universita, Prague (Czechoslovakia). Dept. of Microbiology.
For primary bibliographic entry see Field 05B.
W73-05265

ARE PLASTIDS DERIVED FROM PROKARYOTIC MICRO-ORGANISMS. ACTION OF ANTIBIOTICS ON CHLOROPLASTS OF EUGLENA GRACILIS,
Komenskeho Universita, Bratislava (Czechoslovakia). Dept. of Bicrobiology.
L. Ebringer.
Journal of General Microbiology, Vol 71, No 1, p 35-52, June, 1972. 7 fig, 5 tab, 45 ref.

Descriptors: *Antibiotics (Pesticides), Chlorophyll, Biodegradation, Water pollution effects, Euglenophyta, Protozoa, Invertebrates, Aquatic algae, Photosynthesis, Chemical analysis, Euglena, Acids, Algae, Cultures.
Identifiers: *Plastics, *Chloroplasts, *Euglena gracilis, *Biosynthesis, Psicofuranine, Formycin, Cytosin arabinoside, Decoyinine, Cordycepin, Echinomycin, Mithramycin, Daunomycin, Cinerubin, Nogalarene, Tubercidin, Anthramycin, Edeine, Porfiromycin, Mitomycin, Myxin, Nalidixic acid, Novobiocin, Primycin, Rubiflavin, Sarkomycin, Streptonigrin, Pactomycin, Viomycin, Streptogramin, Pactomycin, Phleomycin, Carzinophillin, Actinomycin, Nogalamycin, Nogalarol, Metabolites, Prokaryotes, Flagellates, Bleaching index, Culture media, Sample preparation.

Euglena gracilis strain Z was grown in a proteose-peptone-tryptone medium with a 4-day culture at the e of logarithmic growth serving as inoculum. Usually the inoculum contained 10,000 organisms/ml. Methods of cultivation, of determination of chlorophyll, of counting irreversibly bleached organisms, and of counting the colorplasts per organism were as published by Ebringer, Nemec, Santova and Foltinova (1970). Of 144 antibiotics examined with respect to their action on Euglena gracilis chloroplasts, 46 caused irreversible loss of plastids and most inhibited chlorophyll synthesis. These substances included structurally related compounds as well as degradation products of antibiotics. Antibiotics exhibiting bleaching activity were of two general types judged by their mechanisms of action in other systems: (1) Inhibitors of DNA synthesis - anthramycin, edeine, profiromycin, and mitomycins, myxin, nalidixic acid and its derivatives, novobiocin, primycin, rubiflavin, sarkomycin and streptonigrin; (2) Inhibitors of protein synthesis - 29 antibiotics which carry a common molecular denominator in their structure (an aminohexose) and three antibiotics which lack aminosugar moieties: viomycin, streptogramin and pactamycin. Only these two types of antibiotics permanently eliminated chloroplasts; antibiotics classified as possessing other mechanisms of action were not effective. All these bleaching antibiotics inhibited replication of plastids in concentrations having no effect on normal Euglena division. A diluting-out of pathological plastids is the explanation of this 'bleaching phenomenon'. (Byrd-Battelle)
W73-05268

EFFECTS OF GROWTH RATE AND INFLUENT SUBSTRATE CONCENTRATIONS ON EFFLUENT QUALITY FROM CHEMOSTATS CONTAINING BACTERIA IN PURE AND MIXED CULTURE,
Purdue Univ., Lafayette, Ind. School of Civil Engineering.
For primary bibliographic entry see Field 05B.
W73-05269

EFFECTS OF ACETATE AND OTHER SHORT--CHAIN FATTY ACIDS ON SUGAR AND AMINO ACID UPTAKE OF BACILLUS SUBTILIS,
National Inst. of Neurological Diseases and Stroke, Bethesda, Md. Lab. of Molecular Biology.
C. W. Sheu, W. N. Konings, and E. Freese.
Journal of Bacteriology, Vol 111, No 2, p 525-530, August, 1972. 5 fig, 5 tab, 1 5 ref.

Descriptors: *Growth rates, *Inhibition, *Amino acids, *Carbhydrates, Bacteria, Metabolism, Nutrients, Inhibitors, Absorption, Biological membranes, Proteins, Carbon radioisotopes.
Identifiers: *Bacillus subtilis, *Fatty acids, *Acetate, Electron transport, Fructose, Alpha-methylglucoside, Serine, Aminoisobutyric acid, C-14, 2 4-dinitrophenol, Substrate utilization.

Bacillus subtilis strains were grown on C-14-labeled L-amino acids, alpha methylglucoside, and fructose as growth media and exposed to acetate and other short-chain fatty acids in order to ascertain metabolic inhibitory mechanisms. Acetate and the fatty acids exhibited strong, non-competitive inhibition on the uptake of L-serine and other L-amino acids, but only slightly affected that of alpha methylglucoside or fructose, whether measured in whole cells or energized (NADH) membrane vesicles. Inhibitory effects proved to be similar to those of 2 4 DNP, and later it was concluded that the mechanism was an 'uncoupling' of the amino acid carrier proteins from the electron transport system. (Mackan-Battelle)
W73-05271

EFFECTS OF FATTY ACIDS ON GROWTH AND ENVELOPE PROTEINS OF BACILLUS SUBTILIS,
National Inst. of Neurological Diseases and Stroke, Bethesda, Md. Lab. of Molecular Biology.
C. W. Sheu, and E. Freese.
Journal of Bacteriology, Vol 111, No 2, p 516-524, August, 1972. 10 fig, 22 ref.

Descriptors: *Growth rates, *Inhibition, Metabolism, Inhibitors, Membrane processes, Cultures, Absorption, Nutrients, Biological membranes, Proteins, Organic acids.
Identifiers: *Bacillus subtilis, *Fatty acids, Adenosine triphosphate, Electron transport, Oxygen consumption.

Fatty acids of different chain lengths were added to cultures of Bacillus subtilis growing in nutrient sporulation medium, and the effects of these fatty acids on growth, oxygen uptake, adenosine triphosphate (ATP) concentration, and membrane protien composition were examined. All fatty acids inhibited growth, the effect being reduced in the presence of glycolytic compounds and reversed by transfer to medium without fatty acids. The inhibition of growth was correlated with

a reduction in both the rate of oxygen consumption and the concentration of ATP per cell. Fatty acids of increasing molecular weights were increasingly inhibitory, but did not adversely affect the electron transport system. The mechanism of inhibition was thought to be an reversible reaction between fatty acids and the cell membrane or its proteins, causing structural changes or uncoupling the elctron transport system, thereby blocking ATP generation and associated membrane transport of essential compounds into the cell. (Mackan-Battelle)
W73-05272

EFFECT OF CYCLOPENTANEGLYCINE ON METABOLISM IN SALMONELLA TYPHIMURIUM,
New York State Univ., Stony Brook. Dept. of Biochemistry.
J. P. O'Neill, and M. Freundlich.
Journal of Bacteriology, Vol 111, No 2, p 510-515, August, 1972. 6 fig, 4 tab, 24 ref.

Descriptors: *Metabolism, *Cultures, *Inhibition, Enzymes, *Amino acids, Organic compounds, Organic acids, Biochemistry, Enteric bacteria, Toxicity.
Identifiers: *Salmonella typhimurium, *Cyclopentaglycine, *Biosynthetic pathways, Culture media, Synthetase, Metabolic regulation, Biosynthesis.

Cyclopentaneglycine (CPG) inhibited the growth of wild-type Salmonella typhimurium. The inhibition was overcome by isoleucine or any isoleucine precursor formed after threonine during amino acid biosynthesis. CPG appeared to mimic isoleucine as a strong inhibitor of the activity of L-threonine deaminase. The analogue was a poor inhibitor of isoleucyl-transfer ribonucleic acid synthetase. CPG did not appear to be incorporated into protein nor did it replace isoleucine in repression. Cells that had recovered from growth inhibition by CPG has derepressed levels of the isoleucine-valine biosynthetic enzymes. (Long-Battelle)
W73-05273

ELIMINATION OF MYCOPLASMA CONTAMINANTS FROM VIRUS STOCKS BY TREATMENT WITH NONIONIC DETERGENTS,
Maryland Univ., College Park. Dept. of Microbiology.
For primary bibliographic entry see Field 05A.
W73-05288

PRODUCTION OF TYPES A AND B SPORES OF CLOSTRIDIUM BOTULINUM BY THE BIPHASIC METHOD: EFFECT ON SPORE POPULATION, RADIATION RESISTANCE, AND TOXIGENICITY,
Army Natick Labs., Mass. Food Lab.
For primary bibliographic entry see Field 05A.
W73-05292

EFFECT OF ZN2 PLUS ON BACTERIAL CONJUGATION: INHIBITION OF MATING PAIR FORMATION,
Institute for Cancer Research, Philadelphia, Pa.
J. T. Ou, and T. F. Anderson.
Journal of Bacteriology, Vol 111, No 1, p 177-185, July 1972. 6 fig, 4 tab, 28 ref.

Descriptors: *E. coli, *Zinc, *Fertility, *Reproduction, Bioindicators, Chromosomes, Cultures, Analytical techniques, Kinetics, Cytological studies, Centrifugation, Incubation.
Identifiers: Deoxyribonucleic acid, Ribonucleic acid, Light microscopy, Coulter counter, Agars.

Nonlethal concentrations of the zinc ion inhibits the formation of mating pairs in E. coli, but has no detectable effect on the later stages in the mating process. E. coli strains were grown and mated in a nutrient broth using an indicator medium for measuring lactose utilization and R streptomycin resistance. Mating pair formation was measured by light microscopy and by Coulter counter. Kinetic studies were also made to analyze Hfr cell recovery. These showed that zinc reduces the fertility of the male but that its effect disappears within 2 min after zinc is removed from the medium. Short treatment of female cells had no apparent effect on their ability to form mating pairs. (Mortland-Battelle)
W73-05293

EFFECT OF SEPTIC-TANK WASTES ON QUALITY OF WATER, IPSWICH AND SHAWSHEEN RIVER BASINS, MASSACHUSETTS,
Geological Survey, Boston, Mass.
G. B. Morrill, III, and L. G. Toler.
Journal of Research, US Geological Survey, Vol 1, No 1, p 117-120, January - February 1973. 3 fig, 1 tab, 3 ref.

Descriptors: *Water pollution sources, *Water pollution effects, *Massachusetts, *Septic tanks, *Urbanization, Urban hydrology, Waste disposal, Base flow, Suburban areas.
Identifiers: *Boston (Mass), Ipswich basin (Mass), Shawsheen basin (Mass).

Many housing projects in the metropolitan area of Boston are beyond the reach of municipal sewer systems. Waste water disposed of through septic-tank or cesspool systems percolates to groundwater reservoirs and eventually reaches the streams. The dissolved-solids load in the streams receiving septic-tank effluent is increased by an amount that can be predicted from the housing density. In the Ipswich and Shawsheen basins, highway deicing salts are the only materials other than septic-tank discharge that contribute to water-quality degradation. Most dissolved solids from septic-tank systems reach the streams. In the range of housing densities observed, dissolved solids in stream base flow can be expected to increase 10 to 15 mg/liter per 100 houses per sq mi. (Knapp-USGS)
W73-05301

RECENT SEDIMENTARY HISTORY OF LAKE MENDOTA, WIS.,
Wisconsin Univ., Madison. Water Chemistry Program.
For primary bibliographic entry see Field 05A.
W73-05339

ALTERNATIVES TO THE HEATING AND EVAPORATION OF GROUNDWATER WHILE STILL SATISFYING THE U.S. ENERGY APPETITE,
W. E. Heronemus.
Meeting Preprint 1 16 p, 1 app.909, American Society of Civil Engineers National Water Resources Engineering Meeting, Jan. 29-Feb. 2, 1973, Wash., D.C. 16 p, 1 app.

Descriptors: *Thermal pollution, *Heated water, *Cooling towers, *Heat budget, *Costs, Powerplants, Cooling water, Sea water, Pumped storage.
Identifiers: *Heat sink, *Solar energy, *Wind power.

More emphasis on the development of alternatives to the extensive use of groundwater resources as a heat sink for powerplants is needed. Based upon the hypothesis that heat sink could be our major energy problem in the future rather than heat sources, such alternatives as sea water cooling, the use of solar energy, and wind power, are discussed. An appendix gives comparative cost figures for a pumped storage and a proposed wind power system. (OWRR)
W73-05350

THE MINERAL QUALITY PROBLEM IN THE COLORADO RIVER BASIN.
Environmental Protection Agency, San Francisco, Calif. Region IX; and Environmental Protection Agency, Denver, Colo. Region VIII.

Report, 1971. 65 p, 9 fig, 9 tab, 4 append.

Descriptors: *Salinity, *Water quality, *Irrigation effects, Irrigation, Irrigation water, Water pollution control, Return flow.
Identifiers: Mineral quality, Colorado River Basin, Salinity studies, Salinity control.

The Colorado River Basin Water Quality Control Project was established as a result of recommendations made at the first session of a joint Federal-State 'Conference in the Matter of Pollution of the Interstate Waters of the Colorado River and Its Tributaries' held in 1960. This project serves as the technical arm of the conference and provides the conferees with detailed information on water uses, the nature and extent of pollution problems and their effects on water users, and recommended measures for control of pollution in the Colorado River Basin. In 1963, The Colorado River Basin Water Quality Control Project began detailed studies of the mineral quality problem in the Colorado River Basin. The more significant findings and data from the project's salinity studies are summarized. Detailed information pertaining to the methodology and findings of the project's salinity studies are presented in three appendices--Appendix A, 'Natural and Man-made Conditions Affecting Mineral Quality',' Appendix B, 'Physical and Economic Impacts,' and Appendix C, 'Salinity Control and Management Aspects.' (Skogerboe-Colorado)
W73-05353

THE ALGICIDAL EFFECT OF COPPER ON A GREEN AND A BLUE-GREEN ALGA AND SOME ECOLOGICAL IMPLICATIONS,
University Coll. of North Wales, Bangor. Dept. of Plant Biology.
C. E. Gibson.
Journal of Applied Ecology, Vol 9, No 2, p 513-518, 1972. 2 fig, 1 tab, 17 ref.

Descriptors: *Algicides, *Copper sulfate, *Chlorophyta, *Cyanophyta, Anabaena, Scenedesmus, Toxicity, Bottom sediments, Mortality, Copper, Algae.
Identifiers: Cefni Reservoir (Anglesey - N. Wales), Anabaena flos-aquae, Scenedesmus quadricauda.

An algicidal dose of copper sulphate was applied to Cefni Reservoir, North Wales, to remove Anabaena flos-aquae, the dominant species. It was quickly replaced by a large crop of Scenedesmus quadricauda, previously a minor plankton constitutent. To explain this phenomenon and to elucidate copper effect on the two algae, laboratory studies were undertaken. Anabaena flos-aquae and Scenedesmus quadricauda were exposed to different concentrations of copper sulphate. A. flos-aquae was more sensitive to copper than S. quadricauda and accumulated more copper. Lethal concentration of accumulated copper was similar for both species. Sensitivity of A. flos-aqae to copper varied with the stage of its growth, becoming less sensitive as the culture aged. Although copper sulphate is more effective as an algicide when used against A. flos-aquae, other conditions being equal, a greater amount of the copper applied will be trapped in its cells and settle to the bottom. Build-up of copper on the bottom sediment, not studied in detail, may be of the order of four or five times faster from dead A. flos-aquae that from S. quadricauda, making more acute the danger of adversely affecting the bottom fauna and probably the whole food web. (Jones-Wisconsin)
W73-05354

SUPPRESSION OF NUCLEIC ACID SYNTHESIS IN CHROMATIN OF SPIROGYRA DURING CONJUGATION PROCESS,
Hokkaido Univ., Sapporo (Japan). Faculty of Science.
K. Sasaki, K. Takaya, and T. Ueno.
Plant and Cell Physiology, Vol 13, No 4, p 601-608, 1972. 6 tab, 22 ref.

Descriptors: *Cytological studies, *Synthesis, *Chlorophyta, *Reproduction, Plant physiology, Biochemistry, Enzymes, Plant morphology, Algae.
Identifiers: *Chromatin, *Spirogyra, Nucleic acids, Histones.

For a clue to the reproduction mechanism in higher plants, the nucleic acid-synthesizing activity changes during the conjugation process of Spirogyra and the regulatory mechanism concerned were studied to confirm the suggestion that decrease of various enzymatic activities during conjugation process may be due to a concurrent decrease in enzyme synthesis. The full template activity of chromatin was estimated by assaying the RNA-synthesizing activity in the presence of sufficient amounts of external RNA polymerase, and the total amount of chromatin-associated RNA polymerase by assaying the RNA-synthesizing activity in the presence of sufficient amounts of external DNA. RNA-synthesizing activity of the chromatin fraction was much lower in conjugating and zygote cells than in vegetatively growing cells. No significant differences were observed in the template activities of purified DNA prepared from vegetatively growing and zygote cells. The activities of DNA purified from vegetatively growing and zygote cells and calf thymus were strongly inhibited at different levels by binding with histones prepared from vegetatively growing and zygote cells. DNA-synthesizing activity of the chromatin fraction of conjugating or zygote cells was much lower than that of vegetatively growing cells. (Jones-Wisconsin)
W73-05356

ORGANIC ENRICHMENT WITH LEAF LEACHATE IN EXPERIMENTAL LOTIC ECOSYSTEMS,
Michigan State Univ., Hickory Corners. W. K. Kellogg Biological Station.
K. W. Cummins, M. J. Klug, R. G. Wetzel, R. C. Petersen, and K. F. Suberkropp.
Mimeo 1972. 17 p, 3 fig, 1 tab, 18 ref. OWRR B-019-MICH (1).

Descriptors: *Streams, *Organic matter, *Leachate, *Leaves, Lotic environment, Fungi, Bacteria, Benthos, Oxygen, Nitrogen compounds, Carbon, Management, Model studies.

To analyze stream ecosystems, two large, temperature, light, and flow controlled, recirculating channels were designed to interface simplified laboratory culture experiments with the full complexity of natural streams. Pattern and capability of this stream community to process approximately ten-fold increases in dissolved organic matter in the form of natural leaf leachate was investigated. After the initial physical, chemical, and biological monitoring, dried and pre-weighed pignut hickory and silver maple leaves were placed in the upstream reservoir of the stream. After removal from the stream the leaves were dried and reweighed. Dissolved organic carbon and particulate organic carbon were measured, fungal populations examined qualitatively, bacteria in transport estimated, and densities of animal benthos in sediments and leaf packs were measured. Microscopic examination of hickory leaves revealed a diverse fungal flora. Dissolved organic nitrogen compounds leached rapidly from the leaves but only LDON was utilized; RDON levels remained high. Successful and comprehensive stream management lies in qualitative, quantitative and rate manipulations of dissolved and particulate organic matter, accomplished by taking advantage of the extensive processing capacity, a basic feature of diverse heterotrophic streams, without destroying diversity upon which the efficiency of such streams depends. (Jones-Wisconsin)
W73-05357

FIELD AND LABORATORY STUDIES ON THE EFFECTS OF CRUDE OIL SPILLS ON PHYTOPLANKTON,
Toronto Univ. (Ontario). Inst. of Environmental Sciences and Engineering.
P. B. Kauss, T. C. Hutchinson, and Marta Griffiths.
In: Proceedings 18th Annual Technical Meeting 'Environmental Progress in Science and Education,' May 1 - 4, 1972, Americana Hotel, New York City, p 22-26. 6 fig, 6 tab, 18 ref.

Descriptors: *Oil spills, *Phytoplankton, *Toxicity, Hydrogen ion concentration, Algae, Chlorella, Plant growth, Aromatic compounds, Oily water.
Identifiers: *Crude oil, Benzene, Toluene, Xylene, Hydrocarbons.

The effects of crude oil and some of its components on phytoplankton were studied in the field and laboratory. Field experiments were conducted in a pond where phytoplankton was established. Spills in September 1970 and June 1971 allowed tests of the method and fate of oil to be followed during freezing of the pond and under snow cover. Bioassays were performed using seven different North American crude oils, an outboard motor oil, and pure hydrocarbons. Results indicated that crude oil extracts can be toxic, that pH changes can occur, and also that aromatic components of crude oils can be toxic in the absence of pH effects. Several crude oils were compared to determine toxicities and the most toxic were selected for further experimentation on extracts with controlled pH. All extracts suppressed growth over a 10-day period, although this time there were no pH differences between control and extracts. It seems apparent that pH effects alone cannot be the sole reason for cruide oil toxicity and that the aqueous extract is toxic per se. Phytoplankton species differ markedly in their response to oil spills in the field. (Jones-Wisconsin)
W73-05358

CRUSTACEAN PLANKTON AND THE EUTROPHICATION OF ST. LAWRENCE GREAT LAKES,
Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst.
K. Patalas.
Journal of the Fisheries Research Board of Canada, Vol 29, No 10, p 1451-1462, 1972. 6 fig, 2 tab, 45 ref.

Descriptors: *Crustaceans, *Plankton, *Eutrophication, *St. Lawrence River, *Great Lakes, Copepods, Lake Superior, Lake Huron, Lake Erie, Lake Ontario, Temperature, Chlorophyll, Phosphorus, Secchi disks, Human population, Drainage area, Depth, Seasonal, Daphnia, Foods, Lake Michigan, Trophic level, Oligotrophy.
Identifiers: Cyclops bicuspidatus thomasi, Diaptomus sicilis, Diaptomus ashlandi, Mesocyclops edax, Daphnia galeata menodotae, Bosmina longirostris, Bosmina coregoni coregoni, Limnocalanus macrurus, Diaptomus minutus, Holopedium gibberum, Daphnia retrocurva, Tropocyclops prasinus mexicanus, Diaptomus oregonensis, Diaptomus siciloides, Diaptomus pallidus, Cyclops vernalis, Senecella calanoides.

Crustacean zooplankton, species and abundance, of Lakes Superior, Huron, Erie, and Ontario during summer months was determined with relations to temperature and eutrophication. Twenty-seven crustacean species were found consisting of 14 copepods and 13 cladocerans. Nine copepods and six cladocerans were common to all four lakes, and 11 copepods and 10 cladocerans were common to lakes Huron, Erie, and Ontario. Cyclops bicuspidatus thomasi was the most abundant species in lakes Huron, Ontario, and Erie; Diaptomus sicilis in Lake Superior. A trend from oligotrophic Lake Superior to eutrophic Lake Erie showed diminishing significance of calanoids accompanied by increasing predominance of cyclopoids and cladocerans. Average crustacean abundance was 43 individuals/sq cm in Lake Superior to 400/sq cm in Lake Erie, and was related to both heat and chlorophyll content of the water. Total phosphorus loading were calculated for the five Great Lakes. The lake-average summer chlorophyll a concentrations as well as Secchi disc visibilities were closely related to phosphorus loading rates thus crustacean abundance was indirectly related to phosphorus loading rates. Based on correlations found, predictions are made about changes in Secchi disc visibility and chlorophyll concentration with increasing human population densities in the drainage basin. (Jones-Wisconsin)
W73-05360

PHOTOHETEROTROPHY AND CHEMOHETEROTROPHY AMONG UNICELLULAR BLUE-GREEN ALGAE,
California Univ., Berkeley. Dept. of Bacteriology and Immunology.
Rosemarie Rippka.
Archiv fur Mikrobiologie, Vol 87, No 1, p 93-98, 1972. 3 tab, 13 ref.

Descriptors: *Cyanophyta, *Biochemistry, *Plant physiology, Photosynthesis, Light intensity, Growth rates, Chlorophyll, Systematics, Algae.
Identifiers: *Photoheterotrophy, *Chemoheterotrophy, Chroococcales, Aphanocapsa, Chlorogloea, Dark, Phycocyanin, Glucose.

A detailed examination of ability of unicellular blue-green algae to grow with glucose in the light and in the dark is presented. Chroococcales (38 axenic strains) were screened for ability to grow photoheterotrophically in the light with glucose in the presence of 0.00001 DCMU, which inhibits photoautotrophic growth. Seven strains could grow photoheterotrophically; four could also grow chemoheterotrophically, though more slowly in the dark with glucose. Six of these belong to the genus Aphanocapsa and one to Chlorogloea; the other 31 strains appear obligate photoautotrophs. The growth behavior of Aphanocapsa 6714 in quantitative study confirmed its facultative photoheterotrophy and chemoheterotrophy. Cells grown in the presence of glucose either in the dark or in the light have a distinctive microscopic appearance, containing a large number of granular inclusions. Comparisons of the absorption spectra of cell suspensions show that the levels of phycocyanin and chlorophyll in dark-grown cells of Aphanocapsa 6714 are not appreciably lower than those in cells which have been grown photoautotrophically or photoheterotrophically. In view of this demonstration of facultative photoheterotrophy, it is not feasible to test routinely for this property in the characterization of axenic strains of blue-green algae. (Jones-Wisconsin)
W73-05361

LIPIDS OF MEMBRANES AND OF THE CELL ENVELOPE IN HETEROCYSTS OF A BLUE-GREEN ALGA,
MSU-AEC Plant Research Lab., East Lansing, Mich.
F. Winkenbach, C. P. Wolk, and M. Jost.
Planta (Berl.), Vol 107, No 1, p 69-80, 1972. 10 fig, 25 ref.

Descriptors: *Lipids, *Membranes, *Cytological studies, *Cyanophyta, Anabaena, Pigments, Biochemistry, Chlorophyll, Algae.
Identifiers: *Cell envelope, *Heterocysts, Anabaena cylindrica, Acyl lipids, Carotenoids, Glycolipids.

Heterocysts isolated by a modified technique contain, in addition to the glycolipids, the acyl lipids and carotenoids of vegetative cells. Glycolipids of hetercysts constitute the 'laminated layer' of the ultrastructure of the heterocyst envelope. Isolated laminated layers were fixed for electron-microscopic study. Lipids and pigments were extracted with chloroform-methanol. The heterocyst glycolipid content was estimated after breaking the vegetative cells by sonication and isolated heterocysts at room temperature. The heterocyst glycolipids, separated from the remaining lipophilic compounds by thin layer chromatography, were reextracted and quantitatively estimated with the anthrone reaction. Heterocysts of Anabaena cylindrica were found to contain all of the same lipids and lipophilic pigments, in about the same proportions, as vegetable cells. In broken filaments and in heterocysts damaged during isolation, the membrane lipids and certain pigments (myxoxanthophyll and an unidentified red pigment) break down rapidly. Electron micrographs of thin-sections and of freeze-etched heterocysts show that the laminated layer is thickened around the pores, and suggest that this layer surrounds the entire cell, except at the pores. The laminated layer is discussed in relation to movement of hydrophilic molecules between the protoplast of the heterocyst and the growth medium. (Jones-Wisconsin)
W73-05362

STUDIES ON CHLOROPLAST DEVELOPMENT AND REPLICATION IN EUGLENA. III. A STUDY OF THE SITE OF SYNTHESIS OF ALKALINE DEOXRIBONUCLEASE INDUCED DURING CHLOROPLAST DEVELOPMENT IN EUGLENA GRACILIS,
Pittsburgh Univ., Pa. Dept. of Biology.
J. M. Egan, Jr., and E. F. Carell.
Plant Physiology, Vol 50, No 3, p 391-395, 1972. 3 fig, 1 tab, 38 ref. NSF GB20903.

Descriptors: *Chlorophyll, *Cytological studies, *Euglena, *Synthesis, Enzymes, Pigments, Genetics, Metabolism, Biochemistry.
Identifiers: *Chloroplast development, *Replication, Alkaline deoxyribonuclease, Euglena gracilis, Photoreceptor, Cycloheximide.

Using nondividing cells, induction pattern of Euglena alkaline DNase during chloroplast development, and effects of inhibitors of protein synthesis on this induction pattern, were investigated. Euglena alkaline DNase activity levels and carotenoid levels were determined for various aplastidic substrains derived from the Z and bacillaris E. gracilis strains. Euglena alkaline DNase increases in a manner similar to that of chlorophyll synthesis, but without the lag customarily associated with early hours of chlorophyll synthesis. Increase in Euglena alkaline DNase activity is not inhibited by chloramphenicol or streptomycin, but is inhibited by cycloheximide. Although Euglena alkaline DNase functions in metabolic activities associated with chloroplasts, its site of synthesis is in the cytoplasm, and this enzyme's genetic information is probably localized in the nucleus. A mitochondrial site of synthesis and genetic information is also possible; however, mitochondrial ribosomes in Euglena have not been conclusively demonstrated, and the mitochondrial genome is extremely small. If the physiological variation among aplastidic substrains is a result of differential effects of bleaching agents upon this cytoplasmic photoreceptor system, studies of action spectra from carefully chosen substrains might allow precise identification of the chemical nature of this photoreceptor. (Jones-Wisconsin)
W73-05363

THE UPTAKE OF PHOSPHORUS BY CERATOPHYLLUM DEMERSUM GROWING IN WASTEWATER,
Michigan State Univ., East Lansing. Dept. of Fisheries and Wildlife.
C. D. McNabb, Jr., D. P. Tierney, and S. R. Kosek.
Institute of Water Research Technical Report No. 24, 1972. 23 p. 1 fig, 3 tab, 39 ref. (Michigan Agricultural Experiment Station Journal Article No. 5462). OWRR A-031-MICH (2).

Descriptors: *Biological treatment, *Phosphorus, *Waste water treatment, *Absorption, *Recycling, Michigan, Aquatic plants, Harvesting, Eutrophication, Carbon, Floating plants, Submerged plants, Nutrients.
Identifiers: *Mineral recycling, *Ceratophyllum demersum, Emergent plants.

The cultivation and harvest of aquatic plants at wastewater treatment sites has long been suggested as a first step in recycling minerals. Potential of an aquatic angiosperm for sequestering harvestable phosphorus during growth in a system of sewage oxidation ponds is evaluated. Experimental plants of Ceratophyllum demersum, a cosmopolitan aquatic angiosperm, were selected from a naturally occurring clone in a pond on the Michigan State University campus. Actively growing tips, 30 cm in length, were transplated to pots placed on the bottom of the third lagoon in a series receiving raw waste from a city. The plant population approached its stationary phase of growth in 57 days. Its dry weight and growth rate compared favorably with maximum rates reported for other aquatic macrophytes. Following transplant, phosphorus concentration in the tissues doubled, reflecting environmental differences in the amount of the element available to the plants. The terminal phosphorus concentration in tissue of 1.3% of dry weight is twice the maximum value ordinarily observed in field studies. Results suggest that continued attention be given to development of managed crops of aquatic macrophytes as one component is mineral recycling schemes using wastewater. (Jones-Wisconsin)
W73-05365

VITAMIN B-12, THIAMINE, AND BIOTIN IN LAKE SAGAMI,
Tokyo Univ. (Japan). Ocean Research Inst.
K. Ohwada, and N. Taga.
Limnology and Oceanography, Vol 17, No 2, p 315-320, 1972. 4 fig, 14 ref.

Descriptors: *Vitamins, *Vitamin B, *Algae, Phytoplankton, Eutrophication, Distribution, Seasonal, Diatoms, Cyanophyta.
Identifiers: *Vitamin B-12, *Thiamine, *Biotin, *Lake Sagami (Japan), Lactobacillus leichmannii, Crytococcus albidus, Achromobacter, Cyclotella, Nitzchia, Anacystis cyanea, Synedra acus.

In Lake Sagami, Japan during 1970, the seasonal variation of vitamin B-12, thiamine, and biotin were determined by microbiological assay methods, and together with other chemical and biological factors, are reported. Vitamin B-12 was determined with Lactobacillus leichmannii, thiamine with Cryptococcus, and biotin with Acromobacter sp. Fluctuations in vitamin concentrations corresponded with the succession of phytoplankton during the year. There is evidence that vitamin B-12 is produced during the period when Anacystis cyanea is actively growing. Thiamine and biotin concentrations increase when biatoms are dominant in the euphotic zone of the lake, whereas vitamin B-12 is decreased at these times. About half of the blue-green algal species tested require vitamin B-12 alone. Carluccii and Bowes have demonstrated with axenic cultures of some algae that a clone requiring an external source of one vitamin produces the other vitamins while growing. Sediments are also a vitamin source for Lake Sagami. These field observations suggest that the vitamin B-12 concentrations show significant seasonal variation according to the kind of phytoplankton present, whereas the thiamine and biotin concentrations appear to be proportional to the amount of phytoplankton present. (Jones-Wisconsin)
W73-05366

THE EFFECTS OF THE DISCHARGE OF SECONDARILY TREATED SEWAGE EFFLUENT INTO THE EVERGLADES ECOSYSTEM.
Miami Univ., Fla. Sea Grant Institutional Program.

Sea Grant Special Bulletin No 6, February 1972. 123 p, 19 fig, 4 tab, 87 ref, 1 appendix. NOAA 2-35147.

Descriptors: *Prototypes, *Effects, *Discharge (Water), *Sewage effluents, Water supply, Model studies, Florida, Water reuse, Hydrogeology, Public health, Design, Microorganisms, Plant populations, Periphyton, Marl, Eutrophication, Invertebrates, Pathogenic bacteria, Fish, Shrimp, Birds, Amphibians, Costs, Reptiles, Mammals, Sewage treatment, Legal aspects, Social aspects, Economic feasibility, Recycling, Ecology, Anaerobic conditions, Standards.
Identifiers: Everglades (Fla.).

Information leading to enhanced and updated understanding of the consequences of diverting secondarily treated sewage effluent flow from ocean outfalls into the Everglades watershed was collected and interpreted. The possible effects on geohydrology, soils, and biology of the environment are examined as well as legal and socioeconomic considerations, and costs of sewage treatment and transmission. Recycling of municipal sewage is necessary to ensure adequate water supplies in South Florida thus this research is directed toward legislators and the general public. The recommendations state that no discharges of any kind should be allowed until standards are established. Exhaustive studies of enrichment effects upon the whole Everglades ecosystem should be made before a minimum level of acceptable treatment is established. Site and method of discharge must be based upon understanding of the geohydrology and discharge rates and quantities must be in keeping with the natural hydroperiodical fluctuations. In view of the immediacy of the water supply crisis and potential for aesthetic, legal, public health, and possible environmental objections to secondary treatment water, it may be that a direct adoption of high quality tertiary treatment followed by reuse is the best course of action. (Jones-Wisconsin)
W73-05367

A NEW RAPHIDIOPSIS SPECIES (CYANOPHTYA, RIVULARIACEAE) FROM MINNESOTA LAKES,
H. Hill.
Phycologia, Vol 11, No 2, p 213-215, 1972. 2 fig, 1 tab, 8 ref.

Descriptors: *Systematics, *Cyanophyta, *Minnesota, Lakes, Plant morphology, Eutrophication.
Identifiers: *Raphidiopsis brookii, *Rivulariaceae, Lake Riley (Minn.), Raphidiopsis mediterranea, Raphidiopsis indica, Anabaenopsis raciborski, Coelosphaerium naegelianum.

During a thorough examination of Lake Riley, Minnesota in 1969, 1970, and 1971, a blue-green alga with sharp pointed trichomes without heterocysts was observed. It was diagnosed as a species of Raphidiopsis and compared with species from Macedonia, India, Ceylon, Burma, and Japan. On the basis of detailed comparisons with R. mediterranea Skuja, R. mediterranea (Rao), and R. indica Singh, a new species, Raphidiopsis brookii was named. The Latin diagnosis with translation is given. It is found as a planktonic alga from August to early October. Lake Riley (300 acres) has a general depth of 20-25 feet, maximum depth 45 feet. Much of the lake bed is sandy. Septic tanks from sewage disposal surround the lake which also receives effluents from upstream sewage disposal plants. Excessive blooms of Aphanizomenon flos aquae, Microcystis, and Coelosphaerium maegelianum are common. The lake has been treated with copper sulfate for several years, and

was so treated about June 30, 1971. By July 14, 1971, strong blooms of A. flos aquae and C. naegelianum had developed. R. brookii was first observed in this lake on August 17, 1971. (Jones-Wisconsin)
W73-05368

AERATION SYSTEMS FOR LARGE NAVIGABLE RIVERS,
Ohio River Div. Labs., Cincinnati.
For primary bibliographic entry see Field 05D.
W73-05369

RELATIVE ABUNDANCE OF THREE MARSH-FLOOR ORGANISMS IN A SEWAGE-AFFECTED MARSH AND IN A SEWAGE-FREE MARSH,
North Carolina Univ., Chapel Hill. Dept. of Zoology.
E. A. McMahan.
Journal of the Mitchell Society, Vol 88, No 2, p 61-64, 1972. 1 fig, 1 tab, 10 ref.

Descriptors: *Marshes, *Marine animals, *Water pollution effects, Amphipoda, Tubificids, North Carolina, Population, Density, Habitats, Oligochaetes, Bioindicators, Crustaceans, Sewage, Effluents.
Identifiers: Collembolans, Spartina alterniflora, Talorchestia longicornis, Monopylephorus rubroniveus, Morehead City (N.C.), Calico Creek (N.C.), Dill Creek (N.C.), Sminthurides aquatica.

Three marsh-floor dwellers were considered as possible biological indicators of pollution in marine habitats after sampling a Spartina marsh exposed to treated sewage wastes and a similar but nonpolluted marsh. Systematic sampling of the marsh surface and the upper 2 cm of substrate was carried out in both marshes to compare population densities of the amphipod, Talorchestia longicornis, the collembolan Sminthurides aquatica var. levanderi, and the tubificid Monopylephorus rubroniveus. The amphipods and collembolans were sampled with a shop vacuum cleaner with an extension tube plugged into a portable generator. Worm samples were taken by pushing a plastic jar, open end down, into the mud to about 2 cm depth. A small plastic spade was used to undercut the jar, trapping the substrate inside. Significantly more collembolans were captured in the sewage-free marsh, and significantly more amphipods and tubificids were captured in the polluted marsh. Presence of amphipods, tubificids, and collembolans in both polluted and sewage-free marshes complicates their use as biological indicators. More studies, involving relative densities of all substrate inhabitants seem indicated. Some other factor of factors--such as sediment size, Spartina density, current patterns, or predator pressure--are also considered. (Jones-Wisconsin)
W73-05370

ZOOPLANKTON DISTRIBUTION IN LAKE KINNERET (ISRAEL), 1969-1970,
Kinneret Limnological Lab., Tiberias (Israel).
M. Gophen.
Israel Journal of Zoology, Vol 21, p 17-27, 1972. 6 fig, 1 tab, 7 ref.

Descriptors: *Zooplankton, *Distribution, Copepods, Crustaceans, Rotifers, Seasonal, Depth.
Identifiers: *Lake Kinneret (Israel).

This quantitative study of zooplankton in Lake Kinneret, Israel, deals with seasonal and bathymetrical distribution. Lake temperature range is 15-30 C. More than 70 weekly zooplankton samples were taken during December 1968 to July 1970 at three different stations and number of organisms per square meter were counted. The distinct seasons were the short homothermic winter period with high nutrient levels and oxygen at all depths, and the long summer with clear stratification of temperature, oxygen, and nutrients. In winter, many nutrients are brought into the lake by rivers, when there is a large population of zooplankton (Copepoda, mainly nauplii and first copepodite stages, Cladocera and Rotifera) in all depths. Life in the summer is confined to the epilimnic and metalimnic layers. There may be a connection between the algal biomass decrease, sedimentation of particulate material during the stratification period, and the low rotifer numbers. Copepods are present in high numbers throughout the year; the Cladocera populations show two peaks, in winter and in early summer; and the rich winter populations of rotifers decrease sharply in the summer. (Jones-Wisconsin)
W73-05371

ORGANIC DETRITUS OF A TROPICAL ESTUARY,
National Inst. of Oceanography, Cochin, (India). Biological Oceanography Div.
S. Z. Qasim, and V. N. Sankaranarayanan.
Marine Biology, Vol 15, No 3, p 193-199, 1972. 2 fig, 5 tab, 33 ref.

Descriptors: *Detritus, *Organic matter, *Estuaries, *Tropical regions, Energy transfer, Food chains, Sedimentation, Chemical properties, Seston, Phytoplankton, Productivity, Chlorophyll, Carbon, Phosphorus, Nitrogen, Bottom sediments, Proteins, Lipids, Carbohydrates, Trophic level, Aggregates.
Identifiers: Cochin Backwater (India), Nutritional value.

Entry of detritus into the food chain seems to increase efficiency of energy transfer from one trophic level to another. A quantitative estimation is given of settled detritus and its chemical composition in Cochin Backwater, India, a tropical estuary studied during 1965/1970. In addition to plankton, large quantities of benthic algae, rooted plants, animal matter, suspended soft mud and material brought down by rivers and land runoff constitute the main sources of detritus. Detritus sedimentation in the estuary attains its maximum from April to June. Living phytoplankton forms a very small portion. Detrital pigments largely include degraded chlorophyll (phaeophytin). Detritus forms a major portion of seston, while phytoplankton productivity constitutes 0.1 to 1.0% of settled detritus. Particulate carbon, nitrogen, and phosphorus show a remarkable consistency in detritus throughtout the year. The caloric value of detritus, calculated from protein, carbohydrate and lipid fractions and also from total carbon, indicates that sedimented detritus does not have a high nutritional value. However, it is readily available material and is ingested as food by a wide variety of estuarine animals, thus constituting an additional pathway between organic production and animal nutrition. (Jones-Wisconsin)
W73-05372

PRODUCTION OF DISSOLVED ORGANIC MATTER FROM DEAD GREEN ALGAL CELLS. I. AEROBIC MICROBIAL DECOMPOSITION,
Tokyo Univ. (Japan). Dept. of Chemistry.
A. Otsuki, and T. Hanya.
Limnology and Oceanography, Vol 17, No 2, p 248-257, 1972. 13 fig, 3 tab, 28 ref.

Descriptors: *Decomposing organic matter, *Aerobic conditions, *Bacteria, Scenedesmus, Chlorophyta, Lakes, Proteins, Aggregates, Kinetics, Hydrogen ion concentration, Mathematical studies.
Identifiers: *Dissolved organic matter, *Dead algal cells, Dissolved organic carbon, Dissolved organic nitrogen.

Patterns and kinetics of carbon and nitrogen decomposition from dead green algal cells under aerobic conditions and nature of the dissolved organic matter produced were analyzed. Freeze-dried Scenedesmus was experimentally decomposed by microflora from lake mud. Dissolved organic matter was about 7% carbon and about 6% nitrogen by the 30th day. Product was fractionated between butanol and acidified water. One fraction was insolubilized when mixed with butanol, became suspended at the interface between the two solutions, and gave a white amorphous solid after vacuum drying. Its infrared spectrum showed it was proteinaceous and contained more than 14 amino acids. The other was extracted with butanol and gave a dark brown viscous substance on drying. Microbial green algal decomposition may be represented by: quick solution of soluble organic components, relatively rapid decomposition of labile organic constituents, and slow decomposition of refractory organic constituents. These data may be extended to mechanisms of dissolved organic nitrogen production and microbial decomposition of dead algal cell nitrogen. Algal substances may be divided according to resistance to bacterial action into two constituents, a labile organic constituent, decomposing readily, and a refractory organic constituent resistant to bacterial attack. (Jones-Wisconsin)
W73-05373

THE CONTROL OF EUTROPHICATION,
Washington State Dept. of Ecology, Olympia. Office of Technical Services.
E. DeNike.
Report, April 1972. 23 p. 3 fig, 1 tab, 19 ref.

Descriptors: *Control, *Eutrophication, Algae, Nutrients, Harvesting, Predation, Chemcontrol, Management, Biocontrol.

Cultural eutrophication, with the obvious manifestation of algal growths, is caused by the intrusion of nutrients into an aqueous habitat and will advance until the body of water dies or until conditions become so offensive to human senses that the management plan is required. Algal assay procedures show correlation of nutrient concentration with algal productivity; the Bottle Test may be applied to determine a water's nutrient status and sensitivity to change, evaluate materials and products for potential effects on algal growth, and assess changes in waste treatment processes. Efficient mechanical equipment has been developed for aquatic weed harvesting from shallow lakes. Grazers are introduced which may be capable of feeding on overgrowth; a few considered organisms are host specific viruses to infect blue-green algae; snails and beetles to destroy water hyacinths; and moth larvae which feed on alligator weed; the herbivorous manatee has been used successfully as a macrophyte scavenger in warmer waters. Aquatic herbicides are used extensively to control nuisance growths but it is generally agreed that chemical use is poor conservation practice. The most reliable method of control is by proper ecological management and prevention of nutrient movement into the habitat. (Auen-Wisconsin)
W73-05374

EUTROPHICATION AS A PROBLEM IN THE FINGER LAKES,
Cornell Univ., Ithaca, N.Y. Water Resources and Marine Sciences Center.
R. T. Oglesby.
Available from the National Technical Information Service as PB-214 772, $3.00 in paper copy, $0.95 in microfiche. Technical Report No. 53, 1972. 23 p, 4 fig, 4 tab, 9 ref, 12 append. OWRR A-025-NY (1). 14-01-0001-14, 1852, 14-31-0001-3032, 3232, 3532.

Descriptors: *Nutrients, *Phosphorus, *Nitrogen, Water quality control, Water quality, *Phytoplankton, Epilimnion, Hypolimnion, Limnology, *Entrophication, *New York.

Identifiers: *Finger Lakes (NY).

Water quality and related parameters have been established for four of the Finger Lakes and reinforced for a fifth. This information suggests possibilities for water quality management directed at control of phytoplankton production. It also indicates what additional information is needed in order to develop a more refined management model. This project began with a review of the literature concerned with the Finger Lakes and a detailed mapping of land use patterns in their drainage basins and major sub-basins. A program of stream sampling was begun with samples being taken under different climatological and hydrological regimes in an attempt to see if ready correlations between nitrogen and phosphorus and land use could be obtained. In late 1970 emphasis shifted to the lakes themselves and a regular limnological sampling program was initiated and carried out from 1971 to the present. Emphasis was placed on primary plant nutrients and on phytoplankton standing crop, but other standard limnological measurements have been made throughout the course of the surveys. The classic pattern of nutrient variation with fluctuation of primary production in lakes is an inverse relationship with nutrients decreasing as the growth activity of phytoplankton increases. Two striking features of the nutrient-phytoplankton relationship are apparent from the data: (1) the similarity of variation in epilimnetic and hypolimnetic nutrients and (2) the seemingly greater dependence of phytoplankton on soluble phosphorus than saline nitrogen.
W73-05379

AN EVALUATION OF DDT AND DIELDRIN IN LAKE MICHIGAN.
Lake Michigan Enforcement Conference. Lake Michigan Interstate Pesticides Committee.
For primary bibliographic entry see Field 05B.
W73-05380

BIOCHEMICAL STUDIES ON MINAMATA DISEASE III. RELATIONSHIPS BETWEEN THE CAUSAL AGENT OF THE DISEASE AND THE MERCURY COMPOUND IN THE SHELLFISH WITH REFERENCE TO THEIR CHEMICAL BEHAVIORS,
Kumamoto Univ. (Japan). Medical School.
M. Uchida, K. Hirakawa, and T. Inoue.
Kumamoto Medical Journal, Vol. 14, No. 4, p 171-179, 1961. 2 fig, 6 tab, 11 ref.

Descriptors: *Mercury, *Shellfish, *Fish toxins, *Human diseases, Pollutant identification, Human pathology, Heavy metals, Toxicity, Trace elements, Water pollution, Toxins, Laboratory tests, Analytical techniques, Testing, Industrial wastes, Path of pollutants, Biochemistry.
Identifiers: *Mercury pollution, *Minamata disease, Japan, Biochemical studies.

The mercury compound in the toxic shellfish, Hormomya mutabilis Gould, was consistently recovered, on its fractionation, in those fractions in which the causal agent of Minamata disease was present. The mercury compound was present in the solvent-unextractable residues of the shellfish, the CHCl3 extract prepared by extracting the shellfish with the N HCl-CHCl3 solvent system and the enzymatically and nonenzymatically obtained hydrolysates. On hydrolysis by Pronase-P of the shellfish, about 20% of the total mercury compound was found in the hydrolysate. The mercury compound in the shellfish was found to be distillable, in 46.8% of its total content from the N HCl-suspension of the shellfish and in 4.8% from the 2N NaOH-suspension. Mercuric chloride was found in the distillate in less than 0.4% under the same experimental conditions. A chemical relation of the mercury compound in the shellfish to the causal agent of Minamata disease has been discussed. (See also W73-05391 and W73-05392) (Oleszkiewicz-Vanderbilt)
W73-05390

BIOCHEMICAL STUDIES ON MINAMATA DISEASE IV. ISOLATION AND CHEMICAL IDENTIFICATION OF THE MERCURY COMPOUND IN THE TOXIC SHELLFISH WITH SPECIAL REFERENCE TO THE CAUSAL AGENT OF THE DISEASE,
Kumamoto Univ. (Japan). Medical School.
M. Uchida, K. Hirakawa, and T. Inoue.
Kumamoto Medical Journal, Vol 14, No 4, p 181-187, 1961. 2 fig, 4 tab, 13 ref.

Descriptors: *Mercury, *Human diseases, *Shellfish, *Analytical techniques, Heavy metals, Toxicity, Trace elements, Human pathology, Water pollution, Toxins, Laboratory tests, Testing, Industrial wastes, Path of pollutants, Biochemistry, Pollutant identification.
Identifiers: *Minamata disease, *Mercury pollution, Biochemical studies, Japan.

An organic mercury compound has been isolated in a yield of 0.00053 - 0.00082% from toxic shellfish responsible for the onset of Minamata disease. The isolated crystal, white, refractive and plate-shaped, is assigned to C2H6HgS; melting point is at 110 degs -128.5 degs with decomposition and sublimation; the crystal is positive for the sulfide tests. Infrared absorption peaks of the isolated crystal are shown at the wavelengths of 8.5 microns and 13.2 microns. From the analytical data, the presence of a methylmercuric sulfide (CH3-Hg-S-) group has been assumed in the chemical structure of the isolated crystal, C2H6HgS. Discussion has been made on the relation of the isolated organic mercury compound to methyl-methylmercuric sulfide, CH3-Hg-S-CH3 with reference to the causal agent of Minamata disease. (See also W73-05390 and W73-05392) (Oleszkiewicz-Vanderbilt)
W73-05391

BIOCHEMICAL STUDIES ON MINAMATA DISEASE V. AN APPROACH FOR CHEMICAL SYNTHESIS OF THE CAUSAL AGENT OF MINAMATA DISEASE METHYL METHYL-MERCURIC SULFIDE,
Kumamoto Univ. (Japan). Medical School.
M. Uchida, and T. Inoue.
Kumamoto Medical Journal, Vol 15, No 3, p 149-153, 1962. 4 fig, 1 tab, 12 ref.

Descriptors: *Mercury, *Human diseases, *Biochemistry, *Analytical techniques, Laboratory tests, Human pathology, Water pollution, Heavy metals, Toxicity, Chemical reactions, Trace elements, Testing, Industrial wastes, Path of pollutants, Pollutant identification.
Identifiers: *Minamata disease, *Organomercurials, *Methylmercury, Mercury pollution, Biochemical studies, Japan.

An alternate approach for the synthesis of methyl methylmercuric sulfide, the causal agent of Minamata disease has been described, which includes methylmercuric iodide and methylmercaptide as reactants. The yield was 46% on the basis of moles of methylmercuric iodide. Two recrystallizations, from chloroform and from absolute ethanol yielded 85.7% and 81.4% respectively. The results of elementary analysis of the synthetic sample are well in accord with the theoretical values for MMMS. Infrared absorption and X-ray powder diffraction gave results for the synthetic sample which were identical with those of MMMS. (See also W73-05390 and W73-05391) (Oleszkiewicz-Vanderbilt)
W73-05392

STUDIES ON THE ORIGIN OF THE CAUSATIVE AGENT OF MINAMATA DISEASE I. ORGANIC MERCURY COMPOUND IN THE FISH AND SHELLFISH FROM MINAMATA BAY,
Kumamoto Univ. (Japan). Medical School.
K. Irukayama, T. Kondo, F. Kai, and M. Fujiki.
Kumamoto Medical Journal, Vol 14, No 4, p 158-169, 1961. 13 tab, 9 ref.

Descriptors: *Mercury, *Biochemistry, *Human diseases, *Analytical techniques, Human pathology, Toxicity, Fish toxins, Toxins, Shellfish, Heavy metals, Trace elements, Water pollution, Laboratory tests, Testing, Industrial wastes, Path of pollutants, Animal pathology, Fish pathology, Biochemistry, Pollutant identification.
Identifiers: *Mercury pollution, *Minamata disease, Animal experiments.

The organic mercury in the shellfish from Minamata Bay combines with the protein and no mercury could be extracted with water and organic solvents from the denatured protein. From alkali- and acid-hydrolysates of the shellfish, mercury was extracted with organic solvents. Animal experiments showed that the extracted mercury seems to be in an organic form. One third of the mercury in the shellfish was in the filtrate from a digest which had been treated with 0.04% pepsin solution, pH 1.6, at 37 C for 24 hours. When the extracted protein and the fish from Minamata Bay were digested by the same method, most of the mercury in them was transferred into the digested fluid. From these results and animal experiments with the mercury extracted from the distillate with chloroform, the mercury compound is considered to be an organic mercury, having a boiling point over 100 C. The mercury compound in organs of human and animal cases appears to remain in an organic form. (See also W73-05394 and W73-05395) (Oleszkiewicz-Vanderbilt)
W73-05393

STUDIES ON THE ORIGIN OF THE CAUSATIVE AGENT OF MINAMATA DISEASE II. COMPARISON OF THE MERCURY COMPOUND IN THE SHELLFISH FROM MINAMATA BAY WITH MERCURY COMPOUNDS EXPERIMENTALLY ACCUMULATED IN THE CONTROL SHELLFISH,
Kumamoto Univ. (Japan). Medical School.
K. Irukayama, M. Fujiki, F. Kai, and T. Kondo.
Kumamoto Medical Journal, Vol 15, No 1, p 1-12, 1962. 2 fig, 13 tab, 2 ref.

Descriptors: *Mercury, *Shellfish, *Human diseases, *Biochemistry, *Analytical techniques, Human pathology, Toxicity, Fish toxins, Toxins, Heavy metals, Trace elements, Water pollution, Laboratory tests, Testing, Industrial wastes, Path of pollutants, Animal pathology.
Identifiers: *Mercury pollution, Minamata disease, Biochemical studies, Animal experiments.

The mercury content in the shellfish from Minamata Bay was about 100 ppm at the end of 1959. Afterwards it decreased gradually to 30 ppm in August, 1960, but in January of 1961 it showed a transitory increase to 50 ppm. In December, 1961 it was 10 ppm. The mercury content in organs of the control shellfish cultured in the sea water containing inorganic mercury compounds was higher in the gills than in other organs. Shellfish from Minamata Bay had a higher concentration in the nerve nodules. Animals fed the fish and shellfish of Minamata Bay had a relatively higher mercury content in the brain than in other organs. These results indicate that the mercury compound in the shellfish from Minamata Bay might be the same as that accumulated in organs in cases of Minamata disease and that inorganic mercury compounds do not change to organic mercury compounds in the shellfish. From the results of digestion and steam distillation of the control shellfish cultured in the sea water containing various inorganic and organic mercury compounds, the organic mercury in the shellfish from Minamata Bay was considered to be an ethyl- or methylmercury compound. (See also W73-05393 and W73-05395) (Oleszkiewicz-Vanderbilt)
W73-05394

STUDIES ON THE ORIGIN OF THE CAUSATIVE AGENT OF MINAMATA DISEASE III. IN-

DUSTRIAL WASTES CONTAINING MERCURY COMPOUNDS FROM MINAMATA FACTORY,
Kumamoto Univ. (Japan). Medical School.
K. Irukayama, F. Kai, M. Fujiki, and T. Kondo.
Kumamoto Medical Journal, Vol 15, No 2, p 57-68, 1962. 6 fig, 8 tab, 3 ref.

Descriptors: *Mercury, *Toxicity, *Path of pollutants, *Shellfish, *Human pathology, Sediments, Sludge, Industrial wastes, Heavy metals, Analytical techniques, Laboratory tests, Animal metabolism, Human diseases, Food chains, Water pollution, Toxins, Laboratory equipment.
Identifiers: *Methylmercury, *Minamata disease, Organomercurials, Japan, Mercury pollution.

In Minamata Factory, HgCl2 has been used as a catalyst for the production of vinylchloride and HgSO4 for the production of acetaldehyde. An organomercury compound was demonstrated in the mud of the drainage from Minamata Factory, and its chemical properties resembled those of the mercury compound extracted from the fish and shellfish in Minamata Bay. An organomercury compound was extracted from the sludge in the acetaldehyde plant of the factory and its chemical structure was identified to be CH3HgCl which was considered an important causative agent of Minamata disease. A possible pathway for the synthesis of CH3HgCl in the acetaldehyde plant is presented. Studies on cats treated with CH3HgCl revealed symptoms similar to the Minamata disease. (See also W73-05393 and W73-05394) (Oleszkiewicz-Vanderbilt)
W73-05395

ACCELERATED ELIMINATION OF METHYL MERCURY FROM ANIMALS,
Kumamoto Univ. (Japan). Medical School.
H. Takahashi, and K. Hirayama.
Nature, Vol 232, p 201-202, July 16, 1971. 2 fig, 4 ref.

Descriptors: *Mercury, *Heavy metals, *Animal metabolism, Laboratory animals, Toxicity, Metals, Laboratory tests, Testing, Human pathology, Path of pollutants, Pollutant identification, Lethal limit, Public health.
Identifiers: *Methylmercury, Mercury poisoning, Medical treatment, Prophylactic measures, Mercury metabolism.

Reduced human hair powder lowered the level of the residual methyl mercury in mice poisoned with methyl mercuric chloride. This indicates that methyl mercury excreted into the intestine is eliminated by this procedure in the feces. The results also suggest that reabsorption of methyl mercury excreted into bile is one of the reasons for the prolonged biological half life of methyl mercury in the animal and that any material which has methyl mercury binding capacity and is resistant to digestion and absorption from the intestine could be useful for eliminating methyl mercury from animals. Third, synthetic resins with SH groups may be effective for the same purpose. The procedure may be used in cases of accidental ingestion of organic mercury or it may be used prophylactically when food is consumed that is contaminated with methyl mercury. (Oleszkiewicz-Vanderbilt)
W73-05398

RESTORATION OF MERCURY CONTAMINATED LAKES AND RIVERS,
Swedish Water and Air Pollution Research Lab., Stockholm.
For primary bibliographic entry see Field 05G.
W73-05400

EXCRETION OF STRONTIUM 90 AND CESIUM 137 WITH FISH EGGS DURING SPAWNING, (IN RUSSIAN),
Akademiya Nauk SSSR, Sverdlovsk. Inst. of Plant and Animal Ecology.
For primary bibliographic entry see Field 05B.
W73-05402

STUDY OF THE UPTAKE, CONCENTRATION AND METABOLISM OF STRONTIUM 85 BY THE DECAPOD CRUSTACEAN CASCINUS MAENAS, (ETUDE DE L'ABSORPTION, DE LA CONCENTRATION ET DU METABOLISME DU STRONTIUM 85 CHEZ LE CRUSTACE DECAPODE CARCINUS MAENA S),
Commissariat a l'Energie Atomique, Cherbourg (France). Centre de la Hague.
J-L. M. Martin.
Marine Biology, Vol 12, No 2, p 154-158, January 1972. 3 fig, 8 ref.

Descriptors: *Crustaceans, *Crabs, Strontium, *Absorption, *Retention, *Metabolism, *Calcium, Animal physiology, Growth stages, Life cycles.
Identifiers: Carcinus maenas, *Strontium 85.

Variations of the specific activity rates due to the absorption and retention of Strontium 85 by Carcinus maenas L. have been studied for the whole animal considering size, metabolism and the nature of the contaminated water. The various stages of the intermoult cycle for the entire animal and for the organs and tissues likely to be affected by the uptake and storing of strontium 85, such as the hepato-pancreas, hypoderm, blood, gills, muscle and exoskeleton were also investigated. The gills and heolymph accumulated little 85Sr in the course of the intermoult cycle. The hepatopancreas put the 85Sr in reserve during the last stages of the cycle. The amount of 85Sr absorbed by Carcinus maenas L. is related to the condition of the exoskeleton. The rate of accumulation of 85Sr by the whole animal has a close relation with the requirements of calcium ions necessary to the building of the exoskeleton. A comparison is made between the behavior of the metabolism due to 85Sr and the amount of calcium in the decapodes. (Ensign-PAI)
W73-05416

LOGARITHMIC RELATIONSHIP OF DDE RESIDUES TO EGGSHELL THINNING,
Bureau of Sport Fisheries and Wildlife, Laurel, Md. Patuxent Wildlife Research Center.
L. J. Blus, C. D. Gish, A. A. Belisle, and R. M. Prouty.
Nature, Vol 235, No 5338, p 376-377, February 18, 1972. 1 fig, 23 ref.

Descriptors: *Pesticide residues, *DDE, *Water birds, *Bird eggs, *Hatching, Mathematical studies.
Identifiers: *Brown Pelicans, Cormorants, Herring Gulls, Prairie Falcons, White Pelicans, American Kestrels, Eggshell thinning, Logarithmic relationship.

A concentration-effect relationship was found to exist between DDE in eggs and shell thinning and seems to follow a mathematically similar pattern in different species although it appears to operate at different levels in the different species. The relationship was essentially linear ($P<0.01$) on a logarithmic residue scale. A level of DDE in eggs that would result in population collapse among brown pelicans would not effect an overall population change among herring gulls. (Ensign-PAI)
W73-05418

THE NATURE OF SHELLFISH AND ECOLOGICAL FACTORS CONTRIBUTE TO THEIR ROLE IN FOOD BORNE HUMAN DISEASE,
Missouri State Dept. of Public Health and Welfare, Springfield. Environmental Public Health.
H. Bengsch.
Journal of Environmental Health, Vol 34, No 4, p 373-378, January/February 1972. 25 ref.

Descriptors: *Shellfish, *Clams, *Oysters, *Mussels, *Ecology, *Diseases, Fish diseases, Human diseases, Discharge (Water), Estuaries, Municipal wastes, Industrial wastes, Agricultural runoff, Food habits, Food chains, Public health.
Identifiers: *Bivalves.

The nature of the shellfish habitat and the method by which they obtain their food render them especially susceptible to disease producing organisms. Except for sea clams and sea mussels, the majority of bivalve shellfish (oysters, clams and mussels) live in estuaries filled with shallow brackish water in coastal regions. Such estuaries are subject to effluents from municipal, industrial, suburban and agricultural discharges. Since bivalves pump large amounts of water through their systems each day there is the danger that the greater the pollution load the greater the concentration of potentially infectious organisms in the shellfish. (Ensign-PAI)
W73-05421

OIL RECONNAISSANCE IN THE MAGDALEN ISLANDS - 1970,
Bedford Inst., Dartmouth (Nova Scotia). Atlantic Oceanographic Lab.
For primary bibliographic entry see Field 05B.
W73-05427

THE EFFECT OF KUWAIT CRUDE OIL AND A SOLVENT EMULSIFIER ON THE METABOLISM OF THE MARINE LICHEN LICHINA PYGMAEA,
Bristol Univ. (England). Dept. of Botany.
D. H. Brown.
Marine Biology, Vol 12, No 4, p 309-315, February, 1972. 1 fig, 4 tab, 17 ref.

Descriptors: *Lichens, *Oil pollution, *Emulsifiers, *Metabolism, *Toxicity, Indicators, Solvents, Oil spills, Water pollution treatment.
Identifiers: *L. pygmaea, *Kuwait crude oil, *BP 1002 emulsifier, Photosynthesis, Carbon fixation.

Lichens have been shown to be sensitive monitors of environmental pollution, including marine pollutants. This study deals with the effects of Kuwait crude oil and BP 1002, a solvent emulsifier on the lichen, Lichina pygmaea. The effect of these pollutants on the total 14C-fixation and on the pattern of fixation was investigated during photosynthesis in the presence of NaH14CO3. The results indicate that exposure to the emulsifier BP 1002 inhibits the metabolism of L. pygmaea substantially more than exposure to Kuwait crude oil. The BP 1002 caused loss of labelled material from the lichen, while the oil induced no such loss. Effects of the emulsifier are dependent upon its concentration and the length of time in which the lichen is exposed to it. The inhibitory component of the emulsifier is the surfactant and not the solvent. (Ensign-PAI)
W73-05428

MARINE HYDROIDS AS TEST ORGANISMS FOR ASSESSING THE TOXICITY OF WATER POLLUTANTS. THE EFFECT OF HEAVY METALS ON COLONIES OF EIRENE VIRIDULA (MARINE HYDROIDEN ALS TESTORGANISMEN ZUR PRUEFUNG DER TOXIZITAET VON ABWASSERS TOFFEN. DIE WIRKUNG VON SCHWERMETALLEN AUF KOLONIEN VON EIRENE VIRIDULA),
Hamburg Univ. (West Germany). Institut fuer Hydrobiologie und Fischereiwissenschaft.
L. Karbe.
Marine Biology, Vol 12, No 4, p 316-328, February, 1972. 6 fig, 2 tab, 12 ref.

Descriptors: *Marine animals, *Zinc, *Lead, *Cadmium, *Mercury, *Copper, *Indicators, Toxicity, Growth rates, Animal physiology, Water pollution effects.
Identifiers: *Hydroids, *E. viridula, *Morphological effects, *Hydranths.

Eirene viridula, a colonial hydroid, was cultured in natural sea water; various dosages of zinc, lead, cadmium, copper, or mercury were then applied to the polyps in order to assess their response to pollutants. Both standard (2 to 3 weeks) and long-term (3 months) experiments were conducted. Low doses of all of the heavy metals tested caused morphological changes and tissue reorganization of hydrants; tissue disintegration occurred within a few hours of doses of 3 ppm copper or 0.3 ppm mercury. Tests indicated that with low doses of most of the metals the damages incurred were reversible after transfer of the hydroids to uncontaminated seawater. However, mercury in doses of as little as 0.02 ppm caused irreversible damages. Threshold concentrations for acute effects were found to be: 1.5 to 3 ppm Zn; 1 to 3 ppm Pb; 0.1 to 0.3 ppm Cd; 0.03 to 0.06 ppm Cu; and 0.001 to 0.003 ppm Hg. E. viridula represents a highly sensitive test organism; with this organism pollutant damage may be measured in several areas-morphological effects, colony growth and reduction of hydranth number. (Ensign-PAI)
W73-05429

RECONNAISSANCE STUDIES OF BENTHIC ORGANISMS IN NEW YORK HARBOR AND ADJACENT WATERS,
Eastern Connecticut State Coll., Willimantic.
For primary bibliographic entry see Field 05B.
W73-05432

BIOLOGICAL EFFECTS OF WASTE DISPOSAL IN WESTERN LONG ISLAND SOUND: AN INITIAL SURVEY,
Suffolk County Community Coll., Seldon, N.Y.
R. J. Kalin.
In: Survey of Marine Waste Deposits, New York Metropolitan Region, New York State University, Stony Brook, Marine Sciences Research Center Technical Report No 8, April, 1971. p 56-67, 4 fig, 5 tab.

Descriptors: *Waste disposal, *Environmental effects, *Indicators, *Marine animals, Sampling, Sediments, Pollutants.
Identifiers: *Long Island Sound, *Foraminifera.

A study was designed to evaluate possible effects of waste disposal operations in Western Long Island Sound and its adjacent waters. The area studied consisted of six regions whose total area approximated 30 square kilometers. Foraminifera were used as biological indicators because of their small size, large numbers, and limited mobility. Their large numbers made possible statistically significant studies on the community level using relatively small sediment samples. Sediment samples were collected using a Shipek sampler; cores were collected with a Phleger-type short coring device. The total number of living foraminifera per sample indicated higher ratios of living foraminifera to the total number of species in the western and southern parts of the sampling area. (Ensign-PAI)
W73-05433

PRELIMINARY STUDY OF THE GLOBAL POLLUTION EFFECTS ON THE PLANKTON POPULATION IN THE NORTHERN HARBOUR OF MARSEILLES (ETUDE PRELIMINAIRE DES EFFETS DE LA POLLUTION GLOBALE SUR LE PEUPLEMENT PLANCTONIQUE DES PORTS NORD DE M ARSEILLE),
Centre Universitaire de Luminy, Marseille (France). Laboratoire d'Hydrobiologie Marine.
G. Patriti.
Marine Biology, Vol 12, No 4, p 300-308, February 1972. 5 fig, 6 tab, 6 ref.

Descriptors: *Harbors, *Seston, *Eutrophication, *Plankton, Pollutants, Water pollution effects.
Identifiers: *Marseilles Harbor (France), *Biological parameters.

Results of a preliminary exploration of half-closed or closed marine spaces which come under the influence of pollution and eutrophic factors are detailed. The complexity of the harbor milieu is discussed, and the basic problems are defined. The high concentrations of seston found in the harbor waters act as a parameter in dividing polluted waters from the Marseilles Gulf waters. Other delimiting parameters include high temporary concentrations of holoplankton and other miroplanktonic or semibenthic species. The half-closed area studied provided, for particular periods and under conditions still to be specified, a eutrophic milieu which promotes intensive growth of zooplankton and phytoplankton. (Ensign-PAI)
W73-05438

ENVIRONMENTAL CONSIDERATIONS FOR ESTUARINE DREDGING OPERATIONS,
Oregon State Univ., Corvallis. Graduate Faculty of Ecology.
For primary bibliographic entry see Field 05G.
W73-05443

PUBLIC HEALTH ASPECTS,
Public Health Lab., Exeter (England).
For primary bibliographic entry see Field 05G.
W73-05449

EFFECTS OF CERTAIN PARAMETERS ON BACTERIAL POLLUTION AT A COASTAL SITE,
Water Pollution Research Lab., Stevenage. (England).
A. L. H. Gameson, D. Munro, and E. B. Pike.
In: Symposium on Water Pollution Control in Coastal Areas, May 19-21, 1970, Bournemouth, England, The Institute of Water Pollution Control, London, p 34-54, 1970. 13 fig, 2 tab, 13 ref.

Descriptors: *Shores, *Coliforms, *Statistics, *Environmental effects, Outfall sewers, Tides, Tidal effects, Wind velocity, Water pollution.
Identifiers: *Bacteria count, *Fickian dispersion model, Tidal variations.

The statistical correlations, over a 2-year period, between variations in concentrations of coliform bacteria and environmental factors in coastal waters are examined. Data indicate, among other things, that there is a pronounced tidal variation in coliform counts, the amplitude of the tidal variation is such as to give a roughly fivefold range in coliform counts during the tidal cycle, wind velocity and sea states influence the count, and that these are seasonal variations in the general coliform level. Predictive calculations were based on data gained from using the Fickian dispersion model. (Ensign-PAI)
W73-05450

THE EFFECTS OF POLLUTION ON MARINE ORGANISMS,
Ministry of Agriculture, Fisheries and Food, Burnham-on-Crouch (England). Fisheries Lab.
P. C. Wood.
In: Symposium on Water Pollution Control in Coastal Areas, May 19-21, 1970, Bournemouth, England, The Institute of Water Pollution Control, London, p 55-63, 1970.

Descriptors: *Water disposal, *Oceans, *Marine plants, *Marine animals, Fisheries, Public health, Monitoring, Water pollution sources, Water pollution effects.
Identifiers: *Bio-accumulation, *Long-term effects.

Marine pollution is defined and some aspects of this problem are reviewed. Topics include: sources of pollution, risks to fisheries, fate of substances entering the sea, effects of wastes on marine organisms and public health aspects. The effects of waste disposal on marine organisms are extremely diverse. The need for further study on the long-term effects of disposal into the sea is stressed. The dangers of dumping soluble, stable substances which may have biological effects far from the point of disposal, or be accumulated in the food chain and returned to man are discussed. Routine monitoring of food species, or of sensitive indicator species from various estuaries is seen as one method of assessing the danger of bio-accumulation. (Ensign-PAI)
W73-05451

INDUSTRIAL ASPECTS OF COASTAL POLLUTION,
Imperial Chemical Industries Ltd., Brixham (England). Brixham Research Lab.
L. Carter.
In: Symposium on Water Pollution Control in Coastal Areas, May 19-21, 1970, Bournemouth, England, The Institute of Water Pollution Control, London. p 103-110. 1970. 2 ref.

Descriptors: *Industrial wastes, *Investigations, *Toxicity, Marine animals, Marine plants, Water pollution control, Tax rates.
Identifiers: *Waste treatment techniques, Role of industry.

Some of the techniques currently used for investigating coastal problems are described along with the problems which can arise from the disposal of industrial effluents into the sea. A few of the problem areas covered include the acute toxicity of industrial effluents to marine life, chronic toxicity, deoxygenation of coastal waters and the accumulation of toxic substances by marine organisms. Since industry will continue discharging existing effluents and most likely add new ones, it is clear that much further research is necessary. The need for greater cooperation between industry and government in the area of pollution and research is stressed. Tax relief is suggested for industrial concerns who are spending large sums of money on the prevention of pollution. (Ensign-PAI)
W73-05454

WATER POLLUTION BY OIL -- SOME HEALTH CONSIDERATIONS,
Department of Health and Social Security, London (England).
A. E. Martin.
In: Water Pollution by Oil Seminar, May 4-8, 1970, Aviemore, Inverness-shire, Scotland, The Institute of Petroleum, London, p 153-164, 1971, 17 ref.

Descriptors: *Public health, *Oily water, *Chemicals, *Oil wastes, Fish, Environmental effects, Water pollution effects, *Potable water.
Identifiers: *Cancer.

The inter-relationship between health (in terms of a community's general well-being) and water polluted by oil is considered. The health problems created by oil pollution in areas such as sewage works, fish, public water supplies, and a possible connection between oil pollution and cancer are surveyed. Each category is separately examined; it is generally concluded that oil pollution, to the extent that it is presently known and understood, does not constitute a serious threat to public health. Although many oil residues are toxic, the taint which they leave on fish and the taste and odor of polluted drinking water are such that public consumers would be forewarned. No definite conclusions were drawn on possible linkage between water polluted by oil and cancer, owing mainly to a deficiency of information on the amounts of polycyclic hydrocarbons in the water supplies. (Ensign-PAI)
W73-05456

THE FIGHT AGAINST POLLUTION BY OIL ON THE COASTS OF BRITTANY,
For primary bibliographic entry see Field 05G.
W73-05463

THE SANTA BARBARA OIL SPILL: ECOLOGICAL CHANGES AND NATURAL OIL LEAKS,
University of Southern California, Los Angeles. Allan Hancock Foundation.
D. Straughan, and B. C. Abbott.
In: Water Pollution by Oil Seminar, May 4-8, 1970, Aviemore, Inverness-shire, Scotland, The Institute of Petroleum, London, p 257-262, 1971. 1 fig, 4 ref.

Descriptors: *Oil spills, *Marine flora, *Marine fauna, *Bacteria, Geology, Oceanography, Rainfall, Water pollution effects, California.
Identifiers: *Santa Barbara Channel.

The history of the Santa Barbara oil spill is presented, along with a discussion of the geology and oceanography of the area. Also effects on bacteriology and biology after the oil spill are described. Preliminary conclusions are: (1) the oil did not cause as much damage as first predicted, (2) the area is recovering and (3) it is difficult to determine, under field conditions, which factors were primarily responsible for mortality and observable changes in the biota. The key factors which underlie these three conclusions are: (1) the composition of the oil, (2) a time lag between release of the oil and its arrival onshore, (3) the presence of natural seeps in the area over a long period of time and (4) heavy rain and flooding not long after the spill. (Ensign-PAI)
W73-05464

TOXICITY OF OIL AND OIL DISPERSANT MIXTURES TO AQUATIC LIFE,
National Marien Water Quality Lab., West Kingston, R.I.
C. M. Tarzwell.
In: Water Pollution by Oil Seminar, May 4-8, 1970, Aviemore, Inverness-shire, Scotland, The Institute of Petroleum, London, p 263-272, 1971. 22 ref.

Descriptors: *Oil pollution, *Oil spills, *Chemicals, *Toxicity, Aquatic life, Water pollution effects, Water quality standards.
Identifiers: *Oil dispersants, *Static bioassays.

The environmental implications of the use and over-water transport of crude oils and petroleum products are discussed. Findings of various studies on oil dispersants are outlined and it is concluded that the chemicals used for the dispersion of oil spills are much more toxic than the oil itself. Furthermore, it is maintained that the dispersant-oil mixtures are more toxic than the dispersant alone and still more toxic than simple crude oil. Short-term static bioassays are recommended for determining the relative toxicities of the various oil dispersants. Some studies conducted on the toxicity of petroleum and petroleum oils and derivatives to fish and other forms of aquatic life are reviewed. Long-term studies should be carried out to determine the concentrations of petroleum oils which are not harmful to the environment under conditions of long-term or continuous exposure. With this kind of data it would be possible to establish water quality standards for areas exposed to continuous discharges of petroleum wastes. (Ensign-PAI)
W73-05465

EFFECTS OF OIL ON MARINE PLANTS AND ANIMALS,
University Coll. of Swansea (Wales). Dept. of Zoology.
A. Nelson-Smith.
In: Water Pollution by Oil Seminar, May 4-8, 1970, Aviemore, Inverness-shire, Scotland, The Institute of Petroleum, London, p 273-291, 1971. 1 fig, 83 ref.

Descriptors: *Oil spills, *Oil wastes, *Marine flora, *Marine fauna, Emulsifiers, Toxicity, Water pollution control, Environmental effects, Shores.
Identifiers: *Oil spill clean-up procedures, *Crude oil, *Ecological balance.

With crude oil the low-boiling aromatic hydrocarbons and water-soluble components, like petroleum acids, leach out after a time leaving a residue which has a greatly reduced toxicity but can still cause undesirable mechanical effects. The effects of these residues on sea birds, shore algae, lichens, and other marine fauna and flora are examined. Data gathered on the toxicity of hydrocarbons and other components of petroleum oils on various forms of aquatic life are reviewed. Information gathered from infield observations and experiments are compared with laboratory research results. Attention is also focused on the ecological effects of clean-up procedures, particularly the use of emulsifiers like BP 1002. (Ensign-PAI)
W73-05466

VITAMIN B12, THIAMINE, AND BIOTIN CONTENTS OF MARINE PHYTOPLANKTON,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
For primary bibliographic entry see Field 05B.
W73-05498

UPPER-LETHAL-TEMPERATURE RELATIONS OF THE NYMPHS OF THE STONEFLY, PARAGNETINA MEDIA,
Michigan State Univ. East Lansing. Dept. of Entomology.
D. R. Heiman, and A. W. Knight.
Hydrobiologia, Vol 39, No 4, p 479-493, July 31, 1972. 4 fig, 4 tab, 12 ref.

Descriptors: *Heat resistance, *Thermal stress, *Stoneflies, *Laboratory tests, *Water pollution effects, Water temperature, Aquatic insects, Immature growth stage, Bioassay, Lethal limit, Seasonal, Standing waters, Running waters, Model studies, Size, Environmental effects, Insect eggs, Invertebrates, Growth stages, Dissolved oxygen, Oxygen demand, Methodology, Sampling, Thermal pollution, Physiological ecology.
Identifiers: *Paragnetina media, *Thermal tolerance, Acclimitization, Emergence, Sex, Data interpretation, Nymphs.

The upper lethal temperature of the stonefly, Paragnetina media, was assessed quantitatively in the laboratory to allow prediction of lethal effects in the field. Continuous water flow and static test apparatus were used in evaluating the influence of acclimation temperature, size, sex, season, life stage, current velocity, and testing method upon the upper-lethal temperature of the nymphal stage. Lethal temperature was raised by acclimation to higher temperatures throughout the thermal range examined. The rate of gain of heat resistance was approximately 5 C per day. Acclimation to colder temperatures was much slower. Body size has no significant effect on upper-lethal temperature in summer or autumn, whereas in winter and spring larger nymphs were significantly less tolerant than smaller nymphs. This difference was attributed to sex, not body size per se. Tolerance was significantly less in static waters than in flowing water, faster current significantly increasing heat resistance at all lethal temperatures examined. Upper-lethal temperatures showed seasonal differences independent of acclimation, with nymphs least tolerant in spring when temperature resistance was influenced by sex, molting condition, and proximity of emergence. The most temperature-sensitive stage was the period immediately following egg hatching. The direct effect of upper-lethal temperature is apparently not a limiting factor for P. media in the environment in which it is found. Temperature increases do, however, effect final stages of nymphal development, emergence patterns, and survival after hatching. (Holoman-Battelle)
W73-05505

AN ANALYSIS OF TEMPERATURE EFFECTS ON THE INSHORE LOBSTER FISHERY,
Rhode Island Univ., Kingston. Marine Experiment Station.
J. M. Flowers, and S. B. Saila.
Journal of the Fisheries Research Board of Canada, Vol 29, No 8, p 1121-1125, August 1972. 2 fig, 3 tab, 5 ref.

Descriptors: *Water temperature, *Lobsters, *Shellfish farming, *Productivity, Thermal stress, Regression analysis, Crustaceans, Surface waters, Model studies, Computers, Estimating equations, Yield equations, Commercial shellfish.
Identifiers: Homarus americanus.

In the past, water temperature has been utilized in combination with some measure of fishing effort in the development of economic estimator or predictor equations for the yield of the lobster Homarus americanus. The hypothesis that the inshore lobster fishery in the United States has been overfished since the end of World War II to the point where increases in fishing effort since that time have had only minor effects on the yields was examined. It was shown that suitable yield prediction equations could be developed using only lagged and present temperatures as the independent variables. Comparisons were made of equations developed for the Marine fishery and sections of the Canadian fishery. Further analyses were done comparing equations developed using winter vs. summer temperatures and surface vs. bottom temperatures. (Holoman-Battelle)
W73-05509

ACUTE TOXICITY OF SPENT SULPHITE LIQUOR TO ATLANTIC SALMON (SALMO SALAR),
Department of the Environment, St. John's (Newfoundland). Fisheries Service.
R. C. H. Wilson.
Journal of the Fisheries Research Board of Canada, Vol 29, No 8, p 1225-1228, August 1972. 3 fig, 12 ref.

Descriptors: *Toxicity, *Atlantic salmon, *Sulfite liquors, Biassay, Industrial wastes, Pulp wastes, Juvenile fish, Juvenile growth stage, Hydrogen ion concentration, Dissolved oxygen, Water pollution effects, Water pollution sources, Pulp and paper industry.
Identifiers: *Salmo salar.

Ninety-six-hour static bioassays, with daily toxicant replenishment, were performed on Atlantic salmon (Salmo salar) parr to test for the acute toxicity of spent sulphite liquor (SSL). The LC50 of two batches of fresh SSL varied from 2000 to 2400 ppm, while the LC50 of SSL which had been previously oxidized for 5 days was 2750 ppm. The fish responded differently to oxidized than to fresh SSL. Caution is urged in the application of 96-hr bioassay results on sulphite pulp mill wastes to field situations. (Holoman-Battelle)
W73-05510

AVOIDANCE OF PESTICIDES BY UNTRAINED MOSQUITOFISH, GAMBUSIA AFFINIS,
Environmental Protection Agency, Gulf Breeze, Fla. Gulf Breeze Lab.
D. J. Hansen, E. Matthews, S. L. Nall, and D. P. Dumas.
Bulletin of Environmental Contamination and Toxicology, Vol 8, No 1, p 46-51, July 1972. 1 fig, 3 tab, 6 ref.

Descriptors: *Fish behavior, *Chlorinated hydrocarbon pesticides, *Carbamate pesticides, *Organophosphorus pesticides, Water pollution effects, DDT, Endrin, 2 4-D, Bioassay, Lethal limit, Herbicides, Insecticides, Freshwater fish, Statistical methods.
Identifiers: *Mosquito fish, *Avoidance reaction, Gambusia affinis, Dursban, Malathion, Sevin, Carbaryl, Chi - square statistics, Chlorinated hydrocarbons.

Mosquito fish, acclimated for at least 5 days in 20 degree C freshwater, were tested for their ability to avoid the pesticides DDT, Endrin, Dursban, Malathion, Sevin, and 2,4-D. Initially one concentration higher and two lower than that which produced a 24-hr LC50 in static water bioassays were used. When avoidance was observed, other concentrations were tested to determine the limits that elicited a response by the test fish. The 2-phased investigation tested the ability of the fish to choose between contaminated and uncontaminated water, and the capacity of the fish to discriminate between concentrations avoided in the first phase. Mosquitofish avoided one or more concentrations of DDT, Dursban, Malathion, Sevin, and 2,4-D, but did not avoid endrin. Except for DDT, the concentrations avoided were less than the 24-hour LC50. Those given the choice between two concentrations of the same pesticide either did not discriminate between them or avoided or preferred the higher concentrations. The fish did not discriminate between any of the tested concentrations of malathion or Sevin, nor between the other tested concentrations of DDT, Dursban, or 2,4-D. These studies indicate that fish can avoid some pesticides in laboratory experiments but did not prove that fish in nature would take advantage of this capacity. While five or six pesticides tested were avoided by mosquitofish, Dursban and 2,4-D would be most likely to produce an avoidance response in populations of these fish in the field. (Holoman-Battelle)
W73-05513

SEASONAL PATTERNS OF REPRODUCTION IN NEW YORK. POPULATIONS OF CODIUM FRAGILE (SUR.) HARIOT SUBSP. TOMENTOSOLDES (VAN GOOR) SILVA,
Adelphi Univ, Oakdale, N.Y. Inst. of Marine Science.
For primary bibliographic entry see Field 05B.
W73-05525

KINETICS OF CHLOROPHYLL A AND PLASTOQUINONE A: CHANGES IN RESPONSE TO LIGHT INTENSITY,
Montana Univ., Missoula. Dept. of Botany.
R. P. Sheridan.
Journal of Phycology, Vol 8, No 2, p 166-169, June 1972. 4 fig, 22 ref.

Descriptors: *Cyanophyta, *Plant pigments, *Light intensity, Photosynthesis, Separation techniques, Adaptation, Aquatic algae, Chlorophyll, Magnesium compounds, Organic compounds, Solvent extractions, Enzymes, Cultures.
Identifiers: *Synechococcus lividus, Chlorophyll a, Plastoquinone A, Phycocyanin, Sample preparation, Thermophilic algae, Thin layer chromatography, Ultraviolet absorption, Ultraviolet spectra, Methanol, Optical density, Hypophase.

The thermophilic blue-green alga, Synechococcus lividus, was grown at several light intensities between 200 and 2400 ft-c to determine any changes in content of chlorophyll a, c-phycocyanin, and plastoquinone A (PQA) in response to light. After exposing the algal cells to light for a specific period of time, the pigments were extracted, separated by thin-layer chromatography, and identified by their characteristic ultraviolet spectrum. A 3.4-fold decrease in cellular Chla was observed when cells were exposed to an increase light intensity from 200 to 2400 ft-c. Cells exposed to these light intensities showed a PQA per Chla ratio which varied by a factor of 7 and a PQA per cell ratio which varied by a factor of 1.4. Adaptation to light appeared to result from changes in size of light-gathering antenna of Chl and phycocyanin while the concentration of PQA remained nearly constant. (Long-Battelle)
W73-05526

GROWTH OF GONIUM MULTICOCCUM IN SYNTHETIC MEDIA,
Hokkaido Univ., Muroran (Japan). Inst. of Algological Research.
S. Saito.
Journal of Phycology, Vol 8, No 2, p 169-175, June 1972. 11 fig, 5 tab.

Descriptors: *Nutrient requirements, *Essential nutrients, *Aquatic algae, Chlorophyta, Vitamins, Nitrates, Nitrites, Trace elements, Growth rates, Photoperiodism, Vitamin B, Organic acids, Protozoa, Ammonia, Nitrogen compounds, Ureas, Organic compounds, Freshwater, Spectrophotometry, Calcium, Magnesium, Phosphate, Cultivation, Light, Amino acids.
Identifiers: *Gonium multicoccum, *Culture media, Flagellates, Vitamin B-12, Synthetic media, Acetate, Pyruvate, Arginine, Glutamine, Uric acid, Riboflavin, Thiamine, Nicotinic acid, Pyridoxine, Choline, Inositol, Pantothenate, Folic acid, Pyridoxamine, Cyanocobalamine, p-Aminobenzoic acid, Biotin, Orotic acid, Putrescine, Thymine, Substrate utilization.

A selected medium, to which various types of nutrients would be added, was used to determine the nutrient requirements of 2 strains of the alga, Gonium multicoccum, grown in both continuous light and dark. The nutrients added include C and N sources, vitamins, minerals, and trace elements. In most cases, comparison of nutrient additions were made after a 50 to 70 h incubation, and some after 3 days. Acetate, as carbon source, most efficiently supported algal growth in both continuous light and dark, and could be replaced by pyruvate or lactate in the light only. Sugars were ineffective as a C source. Thiamine was required for optimal growth, and Vitamin B-12 reduced the lag phase but did not change the overall yield. As sole N sources, nitrate, ammonia, and urea were equally effective; however, nitrite, arginine, glutamine, and uric acid supported scant growth. Optimal concentrations of Ca, Mg, and Fe for maximal growth were determined. From the results an optimal medium was devised in which a growth rate of 5.8 doublings per day was obtained at 25 C in continuous light. (Long-Battelle)
W73-05527

THE FRESHWATER DIATOM CYMBELLA CURSIFORMIS NOM. NOV.,
Ohio State Univ., Columbus. Dept. of Botany.
For primary bibliographic entry see Field 05A.
W73-05528

SOME MORPHOLOGICAL VARIATIONS IN THE DIATOM CYMBELLA CISTULA,
Ohio State Univ., Columbus. Dept. of Botany.
For primary bibliographic entry see Field 05A.
W73-05529

ECOLOGICAL IMPLICATIONS OF CULTURE STUDIES ON NEREOCYSTIS LEUTKEANA,
Washington Univ., Seattle. Dept. of Botany.
R. L. Vadas.
Journal of Phycology, Vol 8, No 2, p 196-203, June 1972. 7 tab, 50 ref.

Descriptors: *Algae, *Coasts, *Sea water, *Environmental effects, Ecology, Growth rates, Water temperature, Light intensity, Photoperiodism, Statistical methods, Distribution patterns, Pacific Ocean, Cultures, Density, *Washington, SCUBA diving, Sexual maturity, Germination.
Identifiers: *Nereocystis leutkeana, Nerocystis, Gametophytes, Merospores, Sporophyta, *San Juan Islands, Sample preservation, Sample preparation, Analysis of variance, Duncan's Multiple Range Test, Student's T-test.

Fronds of Nereocystis leutkeana were collected by SCUBA divers in the San Juan Islands, Washington, and experiments conducted to determine (a) factors affecting gametophyte growth, sexuality, and young sporophyte growth, (b) relative field light intensities in subtidal regions normally populated by this algae, and (c) to attempt to relate these results to field distributions. Cultures were grown in artificial or enriched seawater at 5, 10, 15, and 20 C and at photoperiods of 16 hrs light - 8 hrs dark. An additional 8-16 photoperiod was used at 10 C. Various statistical methods were used to analyze differences between means for all experiments. Vegetative growth occurred over a wider range of environmental conditions than did sexuality. Gametophytes matured at 5, 10, and 15 C but not at 20 C. Light was determined to be the single most important factor in sexuality and subsequent sporophyte growth. Increased density did not affect sexuality but significantly reduced sporophyte growth. Field light intensities beneath lower canopy kelps were below minimal light requirements for gametophyte maturation. These data support the view that light sets the lower limits on vertical distribution and that temperature is involved in the latitudinal range of N. luetkeana. (Mortland-Battelle)
W73-05530

CHEMISTRY OF PESTICIDES,
Moscow State Univ. (USSR).
For primary bibliographic entry see Field 05B.
W73-05532

OBSERVATIONS ON CONTROL OF PISTIA STRATIOTES LINN. IN FISH PONDS BY 'GRAMOXONE,'
Central Inland Fisheries Research Inst., Cuttack (India). Fisheries Research Station.
S. Patnaik.
Proc Indian Acad Sci Sect B. Vol 75, No 1, p 15-22, 1972.
Identifiers: Control, Fish, *Gramoxone, *Pistia-Stratiotes-M, Ponds.

An account is given of the yard and field trials conducted at Cuttack which showed that 'Gramoxone' (20% paraquat) at 0.1 to 0.2 kg/ha active ingredient gave complete control of P. stratiotes in 1-2 wk time. The cost of manual clearance and by the weedicide is given. Treatment in installments is recommended to avoid O2 depletion due to rotting of treated weed mass and consequent fish mortality.--Copyright 1972, Biological Abstracts, Inc.
W73-05548

RELATION. BETWEEN MORTALITY AND WATER HARDNESS IN CANADA,
Ottawa Univ. (Ontario). Dept. of Epidemiology and Community Medicine.
L. C. Neri, J. S. Mandel, and D. Hewitt.
Lancet (North Am Ed). Vol 1, No 7757, p 931-934. 1972.
Identifiers: *Canada, *Human mortality, *Water hardness.

Six years' mortality data relating to males aged 35-64 who were resident in each of 516 Canadian municipalities were analyzed with respect to certified cause of death, to local indices of socioeconomic status and climatic stress, and to 14 measured characteristics of the local water-supply. The findings are consistent with a tendency for harder water to reduce the risk of death in general, rather than from cardiovascular causes in particular, by a

margin of up to 15%, or as much as 30%, depending on the geographical units of study employed in the analysis.--Copyright 1972, Biological Abstracts, Inc.
W73-05549

CONTINUOUS PRODUCTION OF EXTRACELLULAR PROTEASE BY BACILLUS SUBTILIS IN A TWO-STAGE FERMENTOR,
Procter and Gamble Co., Cincinnati, Ohio. Miami Valley Labs.
For primary bibliographic entry see Field 05B.
W73-05555

PHYTOPLANKTON IN LAKE TAHOE. DEEP--LIVING POPULATIONS,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
D. A. Kiefer, O. Holm-Hansen, C. R. Goldman, R. Richards, and T. Berman.
Limnology and Oceanography, Vol. 17, No. 3, p 418-422, May 1972. 2 fig, 20 ref.

Descriptors: *Phytoplankton, *Biomass, *Spatial distribution, *Primary productivity, Aquatic algae, Oligotrophy, Standing crops, Euphotic zone, Thermocline, Limiting factors, Chrysophyta, Chlorophyta, Pyrrophyta, Ecological distribution, Aphotic zone, Eutrophication, Photosynthesis, Plant populations, Benthic flora.
Identifiers: *Lake Tahoe, Vertical distribution, Pheophytin, Chlorophyll a, Dinobryon sociale, Elakatothrix gelatinosa, Melosira crenulata, Asterionella formosa, Stephanodiscus rotula.

Most of the phytoplankton biomass in Lake Tahoe is located below the euphotic zone. Chlorophyll concentration was low (0.1-0.2 microgram/liter) in the upper 50 m, reached a maximum (0.7 microgram/liter) at 100 m, and then dropped rapidly to 0.2 microgram/liter at 200 m. Below this it decreased slowly except for two peaks at 320 and 350 m. The vertical distribution of phytoplankton volume agreed with that of chlorophyll. The six dominant species in cell numbers were: Asterionella formosa, Fragilaria crotonensis, Melosira crenulata, Stephanodiscus rotula, Dinobryon sociale and Elakatothrix gelatinosa. There were no qualitative differences in species composition throughout the water column, although the surface samples contained many small thecate dinoflagellates. The amount of pheophytin between 100-475 m ranged from 15-25 percent of the total chlorophyll a pigment, similar to values found in the euphotic zone. This indicated that the chlorophyll in the aphotic zone derived from live algal cells rather than detritus, a conclusion supported by the healthy appearance of the cells and by their demonstrated photosynthethic capacity of being capable of fixing CO2 at significant rates when exposed to near-surface illumination. The relationship between the distributions of phytoplankton standing crop and production is best explained by passive sinking of cells out of the euphotic zone and accumulation in deep waters. This recruitment of deep phytoplankton from surface waters may be an important feature of deep oligotrophic lakes, limiting primary production and nutrient regeneration in the euphotic zone. (Holoman-Battelle)
W73-05557

DIFFERENTIAL EFFECT OF CHLORAMPHENICOL AND ACTINOMYCIN D ON PROTEIN SYNTHESIS IN THE DECAPOD CRUSTACEAN UPOGEBIA LITORALIS,
Athens Univ. (Greece). Dept. of General Biology.
H. A. Pataryas, N. Mylonas, and T. Papachatzakis.
Hydrobiologia, Vol 40, No 1, p 19-23, August 31, 1972. 1 fig, 14 ref.

Descriptors: *Antibiotics (Pesticides), *Proteins, *Crustaceans, Water pollution effects, Shrimp, Industrial wastes, Absorption, Radioactivity techniques, Methodology, Chemical analysis.
Identifiers: *Biosynthesis, *Upogebia littoralis, Chloramphenicol, Pharmaceuticals, Actinomycin D, Sample preparation, Hepatopancreas, Leucine.

A study has been made of the effect of chloramphenicol (CAP) and actinomycin D on the in vivo incorporation of radioactive leucine by the hepatopancreas of the crustacean Upogebia littoralis in an effort to determine what effect the antibiotics have on protein synthesis in a crustacean. Freshly collected animals were injected with 0.026 microcuries of C-14-leucine and divided into groups. The animals were killed by deep freezing after 1,3,6,8 and 12 hr, the hepatopancreas homogenized with TRIS buffer at pH 7.5, the homogenate boiled with NaOH, and the mixture centrifuged for 20 min at 1510 g. The protein was precipitated from the supernatant with 3 M TCA, and the ether dried sample was extracted with acetone, dried, and the radioactivity measured with an automatic Nuclear Chicago gas flow counter. Inhibition of protein synthesis was noted within 6 hours after administration of chloramphenicol; maximum inhibition occurred 8 hours after treatment. No inhibition was noted after administation of actinomycin D; on the contrary, this antibiotic appeared to slightly stimulate protein synthesis as measured by the rate of C-14-leucine incorporation, within 6 to 8 hours after treatment. (Holoman-Battelle)
W73-05558

AN ECOLOGICAL STUDY OF THE MACROPHYTIC VEGETATION OF DOODHADHARI LAKE, RAIPUR, M.P. 3 CHEMICAL FACTORS,
Government Coll. of Science, Raipur (India). Dept. of Botany.
K. S. Unni.
Hydrobiologia, Vol 40, No 1, p 25-36, August 31, 1972. 4 fig, 14 ref.

Descriptors: *Aquatic plants, *Ecological distribution, Physicochemical properties, *Water analysis, Freshwater, Seasonal, Aquatic environment, Chemical analysis, Water quality, Spatial distribution, Sampling, Variability, Carbon dioxide, Alkalinity, Hardness (Water), Magnesium, Calcium, Sodium, Potassium, Specific conductivity, Dissolved oxygen, Colorimetry, Flame photometry, Hydrogen ion concentration, Depth, Ecology, Distribution patterns, Lakes.
Identifiers: *Macrophytes, *Doodhadhari Lake, Titrimetry, Vertical distribtuion, Najas minor, Ceratophyllum demersum, Nelumbo nucifera, Potamogeton erispus, Hydrilla verticillata, *India.

A study was conducted in order to determine the influence of chemical constituents of water on the distribution of aquatic plants in Doodhadhari Lake. Every month a collection was made in early morning and in late afternoon in order to gain an understanding of the monthly variations. Water samples were taken at every half meter depth interval; the factors estimated were dissolved oxygen, free carbon dioxide and alkalinity, pH, total hardness, magnesium, calcium, sodium, potassium and specific conductivity. Seasonal change in chemical composition of the water was quite significant, the most prominent being the fluctuation of dissolved oxygen, both in the vertical and horizontal directions. The macrophytic vegetation was found to exert a profound influence on the restricted volume of water and on the environment through photosynthesis and respiration. The concentration of dissolved oxygen, free carbon dioxide, hydrogen ion concentration and alkalinity have been found to be greatly influenced by the macrophytic vegetation. (Holoman-Battelle)
W73-05559

CAUSES OF MORTALITY IN THE ENDEMIC TILAPIA OF LAKE CHILWA (MALAWI),
Malawi Univ., Limbe.
P. R. Morgan.
Hydrobiologia, Vol 40, No 1, p 101-119, August 31, 1972. 1 fig, 10 tab, 40 ref.

Descriptors: *Mortality, *Tilapia, Water quality, *Environmental effects, *Fish populations, Physiochemical properties, Water pollution effects, Secondary productivity, Freshwater fish, Lethal limit, Absorption, Salinity, Alkalinity, Water temperature, Dissolved oxygen, Water analysis, Anabaena, Forecasting, Heat resistance, Conductivity, Oxygen.
Identifiers: *Lake Chilwa, Barbus paludinosus, Tilapia shirana chilwae, Clarias mossambiscus, Tilapia melanopleura, Survival, Winkler method, Euryhaline.

During 1966 and 1967 extensive mortalities of Tilapia shirana chilwae took place in Lake Chilwa, Malawi. By collating field observations and physico-chemical data from the lake with experimental evidence from the laboratory, it has been possible to predict what the most likely causes of mortality of Tilapia might have been. High winds caused bottom erosion in October, 1966, and the released mud deoxygenated the water. Total deoxygenation of the water results if the level of suspended matter is raised to 12,860 ppm. Tilapia are able to survive levels of oxygen as low as 0.6 mg/l, but become distressed below this figure. The median lethal alkalinity for T. s. chilwae in artificial lake water is 61.6 meq/l. This concentration was reached in the lake in December, 1966, and probably caused further mortalities. T. s. chilwae is remarkably tolerant of high temperature, and this factor alone is unlikely to have caused natural mortalities. Elevated temperatures can cause decreased resistance to low oxygen and high ionic concentration, however, and the dense blooms of Anabaena may have caused sufficient deoxygenation of the water at night to cause further mortalities. T. s. chilwae is more resistant to high alkalinity and high temperature than T. melanopleura. This undoubtedly reflects the long history of stress in the endemic Tilapia. No doubt the heightened resistance of T. s. chilwae has enabled it to successfully populate Lake Chilwa, despite its characteristic instability. (Holoman-Battelle)
W73-05562

FLUORIDE, WATER · HARDNESS, AND ENDEMIC GOITER,
Guy's Hospital Medical Schools, London (England).
T. K. Day, and P. R. Powell-Jackson.
Lancet (North Am Ed), Vol 1, No 7761, p 1135-1138, 1972, Illus.
Identifiers: *Endemic goiter, Fluoride, Himalaya, Iodine, *Water hardness.

The prevalence of goiter in 17 Himalayan villages was estimated. Water-samples from each village were taken, and levels of iodine, fluoride, and hardness determined. In 13 villages wide variations in goiter prevalence were not attributable to differences in iodine intake, which remained constant within a narrow range. Instead, variations in goiter prevalence correlated closely with the fluoride content (rho ± 0.74; P<0.01) and with the hardness (rho ± 0.77; P<0.01) of the water in each village. The effects of fluoride and water hardness seem to be independent.--Copyright 1972, Biological Abstracts, Inc.
W73-05563

EFFECTS OF AROCLOR 1242 (A POLYCHLORINATED BIPHENYL) AND DDT ON CULTURES OF AN ALGA, PROTOZOAN, DAPHNID, OSTRACOD, AND GUPPY,
Washington Univ., Seattle. Coll. of Fisheries.
J. R. Morgan.
Bulletin of Environmental Contamination and Toxicology, Vol 8, No 3, p 129-137, September 1972. 1 fig, 1 tab, 14 ref.

Descriptors: *Bioassay, *Growth rates, *Daphnia, *Protozoa, *Chlamydomonas, *Population, DDT, Path of pollutants, Toxicity, Algae, Water pollution effects, Polychlorinated biphenyls, Chlorinated hydrocarbon pesticides, Invertebrates, Crustaceans, Freshwater fish, Food chains, Laboratory equipment, Fish behavior.
Identifiers: *Aroclor 1242, *Guppy, *Ostracods, Biological magnification, Daphnia pulex, Cypridopsis vidua, Poecilia reticulata, Chlorinated hydrocarbons, Macroinvertebrates, Tetrahymena vorax, Sample preparation, p p' DDT.

In laboratory bioassays, Aroclor 1242 appeared to temporarily inhibit the growth rate of Chlamydomonas as evidenced by cell counts and C-14 uptake, while DDT did not appear to have any effect. A greater concentration of PCB was found in the algal cells than in the media, indicating that concentration and passage of the biphenyl compounds through the food chain may take place. Neither Aroclor 1242 nor DDT in the amounts tested appeared to have any effect on the growth or cell density of Tetrahymena vorax cultures. Daphnia pulex were quite sensitive to additions of Aroclor 1242 as low as 0.02 ppm. The toxicity of PCB and DDT to the ostracod Cypridopsis vidua appeared to be approximately the same. Young guppies died in concentrations of 2 ppm Aroclor 1242. Aroclor 1242 appears to have a much lower toxicity to cladocerans and guppies than p,p'-DDT. Although the effect of PCB on algal growth appeared to be temporary, in view of its evident capability to be passed through the food chain and its selective toxicity to certain zooplankton, it would be unwise to attempt to predict its effect on the ecosystem without further study. (Little-Battelle)
W73-05564

EFFECT OF HEPTACHLOR AND RELATED COMPOUNDS ON GROWTH OF STAPHYLOCOCCUS AUREUS,
Kentucky Univ., Lexington. Dept. of Animal Sciences.
B. E. Langlois, and K. G. Sides.
Bulletin of Environmental Contamination and Toxicology, Vol 8, No 3, p 158-164, September 1972. 3 fig, 1 tab, 4 ref.

Descriptors: *Pesticide toxicity, Bioassay, *Growth rates, *Heptachlor, Cultures, Incubation, Chlorinated hydrocarbon pesticides, Population, Inhibitors.
Identifiers: *Staphylococcus aureus, *Chlordane, *Nonachlor, Gamma chlordane, Culture media, Survival.

Cultures of Staphylococcus aureus in trypticase soy broth were exposed to purified chlordane, 99.8 percent gamma chlordane, 99.5 percent nonachlor, and 72, 73, 74, 99, and 99.8 percent heptachlor to determine the cause of greater growth inhibition with 72 percent heptachlor than with 99.8 percent heptachlor. Subsequent tests were also conducted to determine the effect of initial population, effect of skimmilk broth, and effect of static vs. shaking incubation. All pesticides caused an initial decrease in population and increases in the length of the lag period and the generation time. The initial study suggests that the effect on viability as well as length of lag phase depend on the amount of chlordane and gamma chlordane rather than heptachlor in the pesticides. Both are constituents of technical (72-74 percent) heptachlor. However, generation time in TSB appears to depend on the amount of heptachlor and possibly chlordane present. In the related tests it was found that S. aureus was not affected by heptachlor or chlordane when grown in skimmilk. In addition, larger initial populations resulted in increased viability in TSB with chlordane and heptachlor. When the initial population was less than 100,000/ml, growth was greater in the pesticide samples under static than under shaking incubation. The reverse was found when the initial population was over 1,000,000/ml. (Little-Battelle)
W73-05567

ATMOSPHERIC CARBON DIOXIDE: ITS ROLE IN MAINTAINING PHYTOPLANKTON STANDING CROPS,
Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst.
D. W. Schindler, G. J. Brunskill, S. Emerson, W. S. Broecker, and T.-H. Peng.
Science, Vol 177, p 1192-1194, September 29, 1972. 2 fig, 1 tab, 12 ref.

Descriptors: *Phytoplankton, *Carbon dioxide, *Standing crops, *Eutrophication, *Essential nutrients, Seston, Oligotrophy, Water pollution effects, Radioactivity techniques, Primary productivity, Limiting factors, Epilimnion, Tracers, Carbon, Nitrogen, Fertilization, Phosphorus.
Identifiers: Chlorophyll a, Inorganic carbon, Dissolved carbon, Rn-222.

The rate of invasion of carbon dioxide into an artificially eutrophic Canadian Shield lake with insufficient internal sources of carbon was determined by two methods: measuring the carbon: nitrogen: phosphorus ratios of seston after weekly additions of nitrogen and phosphorus, and measuring the loss of radon-222 tracer from the epilimnion. Both methods gave an invasion rate of about 0.2 gram of carbon per square meter per day. The results demonstrate that invasion of atmospheric carbon dioxide may be sufficient to permit eutrophication of any body of water receiving an adequate supply of phosphorus and nitrogen. (Holoman-Battelle)
W73-05572

EFFECT OF SHELTERS ON THE RESISTANCE OF DOMINANT AND SUBMISSIVE BLUEGILLS (LEPOMIS MACROCHIRUS) TO A LETHAL CONCENTRATION OF ZINC,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Biology.
R. E. Sparks, W. T. Waller, and J. Cairns, Jr.
Journal of the Fisheries Research Board of Canada, Vol 29, No 9, p 1356-1358, September 1972. 1 tab, 9 ref.

Descriptors: *Bioassay, *Fish behavior, *Sunfishes, *Zinc, *Lethal limit, Freshwater fish, Heavy metals, Toxicity, Methodology, Laboratory equipment, Testing procedures.
Identifiers: *Lepomis macrochirus, Zinc sulfate, Shelters.

Due to differences in fish behavior in bioassay, a study was undertaken to determine whether dominant and submissive bluegills (Lepomis macrochirus Rafinesque) would have different times to death when exposed to a lethal concentration of zinc and whether shelters would affect survival times. When pairs of bluegills were kept in bare, 10-gal compartments for 5 days, dominant-submissive relations developed, and the dominant fish survived a subsequent exposure to 32 mg/liter zinc longer than submissive fish. A flowerpot shelter in each compartment reduced the number of aggressive encounters between fish and removed the response difference. These results indicate that dominant-submissive relations may be a source of variability in the results of bioassays that use fish. (Little-Battelle)
W73-05576

THE RESULTS OF TAGGING EXPERIMENTS OF BREAM (ABRAMIS BRAMA) AND ROACH (RUTILUS RUTILUS) IN THE COOLING WATER RESERVOIR OF THE LITHUANIAN HYDROELECTRIC STATION, (IN RUSSIAN),
Akademiya Nauk Litovskoi SSR, Vilnius. Institut Zoologii Parazitologii.
A. S. Astrauskas.
Vopr Ikhtiol. Vol 11, No 1, p 171-174. 1971. Illus.
Identifiers: Abramis brama, *Bream, Catch, Cooling water, Hydroelectric power plants, Lithuanian, Pike, Reservoirs, *Roach, Rutilus rutilus, *Tagging, USSR.

Studies were conducted on the living and migrating patterns of R. rutilus and A. brama in a reservoir 50 km to the west of Vilnius heated by the discharge of the Lithuanian hydroelectric power station. The reservoir is 376 km2 in area and contains 90 x 10 to the 6 power m3 of water. The lake-like northern portion of the reservoir is heated by the power station to up to 10 degs C and, consequently, the entire area does not freeze over in winter. The river-like portion of the reservoir (southern) is under the influence of the river Streva. Thus, the reservoir consists of 2 significantly different ecological regions. Although about 20 spp. of fish can be found in the reservoir, the roach, bream, and pike account for 85% of the catch. In April and May of 1967, 539 breams and 560 roach specimens were tagged and returned to the reservoir in different locations. Following the movement patterns of the fish showed that fish placed in an area different from the one in which they were caught returned to their areas of origin over various periods of time. Thus, it was clear that the fish population consists of tribes localized in the different areas of the reservoir. Each tribe has its spawning location, feeding areas, and wintering areas. In addition, certain tribes preferred to conduct their life cycles in the warmer area of the reservoir.--Copyright 1972, Biological Abstracts, Inc.
W73-05581

THERMAL DISCHARGES INTO LAKES AND COOLING PONDS,
Argonne National Lab., Ill. Center for Environmental Studies.
A. J. Policastro.
Paper, American Society of Civil Engineers National Water Resources Engineering Meeting: Heat Discharge in the Environment (A MiniCourse), Feb. 1, 1973, Wash., D.C. 81 p, 110 ref.

Descriptors: *Water pollution effects, *Thermal pollution, *Energy budget, *Lakes, *Heated water, Temperature, Limnology, Epilimnion, Hypolimnion, Heat transfer, Mathematical models.
Identifiers: *Thermal discharge, *Thermal plume, *Cooling ponds.

The major problems of concern involving heated effluent dispersion in lakes and ponds are summarized. Basic results of theoretical and experimental studies in the attempt to solve those problems are described. The physical effects of thermal discharges into lakes can be subdivided into either global or local influences. Among the lake-wide effects are: the effect on lake eddy budget, lake surface temperature and evaporation loss; effects on the temperature and volume of epilimnion and hypolimnion; effects on thermocline formation, stratification period, and eddy thermal diffusivities; and the interaction of a heated discharge with lake motions. The local effects result mainly from the thermal plume whether at the surface or submerged. Methods of predicting plume location, temperature decay, depth, and areas are summarily reviewed. In addition to the plume itself, secondary effects are discussed: plume effect on the thermal bar, winter shoreline ice, as well as bottom scouring and the winter sinking plume. The discussion of cooling ponds centers mainly on design parameters for shallow ponds and their numerous effects on cooling pond performance. Pond surface heat transfer as well as pond make-up water requirements are discussed. Methods of modeling thermal discharges into shallow ponds are reviewed and a list of the most popular (published) models is given. Physical characteristics of deep ponds and modeling of thermal discharges are then briefly reviewed. (OWRR)
W73-05582

MERCURY LEVELS IN MUSCLE TISSUES OF PRESERVED MUSEUM FISH,
Michigan Dept. of Natural Resources, Lansing. Fish Div.
For primary bibliographic entry see Field 05A.
W73-05585

DIRECT OBSERVATIONS ON THE SUBLITTORAL MARINE ALGAE OF ARGYLL, SCOTLAND,
Glasgow Univ. (Scotland). Dept. of Botany.
For primary bibliographic entry see Field 05A.
W73-05586

MICROBIOLOGICAL PATHOGENS IN ANIMALS AND THEIR DETECTION,
Environmental Protection Agency, Cincinnati, Ohio.
For primary bibliographic entry see Field 05A.
W73-05587

ELECTRICAL RESPONSES OF THE OLFACTORY BULB OF PACIFIC SALMON ONCORHYNCHUS NERKA AND ONCORHYNCHUS KISUTCH,
Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst.
T. J. Hara.
Journal of the Fisheries Research Board of Canada, Vol 29, No 9, p 1351-1355, September 1972. 4 fig, 11 ref.

Descriptors: *Toxicity, *Rainbow trout, *Sockeye salmon, *Bioassay, *Copper sulfate, Copper, Mercury, Heavy metals, Water pollution effects, Fish behavior, Fish physiology.
Identifiers: *Mercury chloride, *Olfactory response, *Coho salmon, Onchorhynchus nerka, Oncorhynchus kisutch, Salmo gairdneri.

Olfactory bulbar electrical responses elicited by nasal infusion of food extracts, hand rinse, and several amino acid solutions were studied in sockeye (Oncorhynchus nerka) and coho (O. kisutch) salmon from several different sources. Comparison was also made in rainbow trout (Salmo gairdneri). Significant variations in the olfactory bulbar responses were observed among different species and even among the same species from different sources. The estimated lowest threshold concentration for L-serine was between .000001 and .0000001 M in salmon. Olfactory responses of rainbow trout were always several times larger than those of salmon. Pretreatment of nasal cavity with .0001 M solutions of $HgCl_2$ or $CuSO_4$ (27 or 16 mg/liter, respectively) for 10 sec completely blocked the olfactory responses in all fish species studied. The effect was reversible; the responses returned to their original level by rinsing. Exposure of fish to 0.1 mg/liter $HgCl_2$ for up to 3 days reduced the olfactory responses to 40-10 percent of those of normal fish. $CuSO_4$ was the more toxic. (Little-Battelle)
W73-05588

CONFERENCE IN THE MATTER OF POLLUTION OF THE NAVIGABLE WATERS OF BISCAYNE BAY AND ITS TRIBUTARIES IN THE STATE OF FLORIDA.
Federal Water Pollution Control Administration, Washington, D.C.

Proceedings of the Conference in the Matter of Pollution of the Navigable Waters of Biscayne Bay and its Tributaries in the State of Florida, February 24,25,26 1970, Miami, Florida; Federal Water Pollution Control Administration, Washington, D.C. 1970. 919 p, 50 fig, 3 illus, 43 photo, 45 tab, 4 chart.

Descriptors: *Thermal pollution, *Florida, *Nuclear power plants, *Heated water, Water pollution, Water temperature, Water cooling, Electric power, Heat flow, Condensers, Federal Water Pollution Control Act, Legislation, Conference, Effluents, Canals, Saline water, Corrosion, Encroachment, Cooling water.
Identifiers: *Biscayne Bay, Coastal waters.

This conference was held under the provisions of the Federal Water Pollution Control Act and investigated the actions of a Florida power company in discharging heated water into Biscayne Bay. Severe damage occurred to aquatic plant and animal populations due to the heated effluent from the Turkey Point plant. The temperature rise of the cooling water exceeded 10 degrees Farenheit at least 16% of the time. The proposed addition of two nuclear powered generating units at the Point would increase the waste heat load by four times. This increased heat load would create damage at the Card Sound discharge area comparable to that at the current discharge area. The direct concern of the conferees was the dischage itself and the effect of the proposed six-mile cooling canal. State and federal government environmental experts testified on the effects of and alternatives to the Card Channel discharge. There was differing testimony as to whether the six-mile canal would serve to cool the water sufficiently. (Nielsen-Florida)
W73-05615

BLOOD PARASITISM OF SOME FISHES FROM MONTANA AND YELLOWSTONE NATIONAL PARK,
Fresno State Coll., Calif.
R. Heckmann.
J Wildl Dis. Vol 7, No 1, p 3-4. 1971. Illus.
Identifiers: Blood parasites, *Fishes, Haemogregarina-Sp, Host, Montana, *Parasitism, Prosopium-Williamsoni, Salmo-Clarki-Lewisi, Yellowstone park.

Blood samples from 498 fish representing 18 species were obtained from locations in Yellowstone National Park, Wyoming. Only 2 fish, Salmo clarki lewisi and Prosopium williamsoni were infected with Haemogregarina sp. Infection rate was about 1:450 blood cells for the 2 fish. These are both probably new host records.–Copyright 1972, Biological Abstracts, Inc.
W73-05655

KINETICS OF CHLORINE DISINFECTION IN ALGAL-BACTERIAL SYSTEMS,
California Univ., Berkeley.
For primary bibliographic entry see Field 05D.
W73-05659

STUDIES ON PREDOMINATION OF SELECTED BACTERIA OF SEWAGE ORIGIN,
Oklahoma State Univ., Stillwater.
For primary bibliographic entry see Field 05B.
W73-05660

MASS CULTURE OF A BLUE-GREEN ALGA IN CONTROLLED LIGHT-DARK REACTOR SYSTEMS,
Michigan Univ., Ann Arbor.
G. R. Pyper.
University Microfilms, 300 N. Zeeb Rd., Ann Arbor, Mich. 48106. Order No. 71-15,274. Ph. D. Dissertation, 1970. 284 p, 64 fig, 18 tab, 168 ref.

Descriptors: *Algae, *Light, *Light intensity, Temperature, Velocity, Nitrate, Nitrite, Phosphates, Waste water treatment, Hydrogen ion concentration.
Identifiers: Dark-light systems.

Conditions were investigated for effective utilization of light in growing algae in mass culture as a potential tertiary treatment for extraction of nitrates and phosphates from wastewaters. Dark-light systems were used to determine effective growth patterns pursuant to dark and light reactions of photosynthesis and to determine whether light integration of any practical significance occurs in light-dark reactor systems. Observable system response variables were: pH, nitrate-nitrogen, nitrite-nitrogen, ammonia nitrogen, orthophosphate, alkalinity and algae growth rate. Physical control variables were light intensity, temperature, and velocity. Results indicated that dark-light detention ratios were most advantageous for high light intensity algal culturing and that high velocities are desirable in mass culture. Total inorganic nitrogen removal and orthophosphate removal were observed to be linear functions of density. Overall indications were that dark-light conditions are advantageous in high light intensity algal culturing. (Murphy-Texas)
W73-05661

INVESTIGATIONS ON THE MATRIX EFFECT IN THE ATOMIC ABSORPTION SPECTROSCOPY OF IRON, COBALT AND NICKEL, (UNTERSUCHUNGEN ZUM MATRIXEFFEKT BEI DER ATOMABSORPTION AM BEISPIEL EISEN, KOBALT, NICKEL),
Muenster Univ. (West Germany). Anorganisch-Chemisches Institut.
R. Hohn, and F. Umland.
Zeitschrift fur Analytische Chemie, Vol 258, No 2, p 100-106, January 24, 1972. 8 fig, 3 tab, 17 ref.

Descriptors: *Iron, *Cobalt, *Nickel, Aqueous solutions, *Salts, Heavy metals, Chemical analysis, Density, Surface tension, Viscosity, Physical properties.
Identifiers: *Atomic absorption spectrophotometry, *Matrix effects, Chemical concentration, Molarity, Chemical interference.

Some of the matrix effects caused by high concentrations of other salts were investigated. It has been found that an increasing salt concentration produced a depression of the absorption signal. This depression was not caused by a change of the density, surface tension, or viscosity of the solution, or by a change of the diameter of droplets of the aerosol, but was connected with the molar concentration in solution. It is accepted that the depression is caused by an increasingly stronger 'imbedding' of the atoms to be measured in the larger salt particles. On the other hand, the formation of compounds in the flame has to be accepted. (Holoman-Battelle)
W73-05667

THE ULTRASTRUCTURE OF THE FRUSTULES OF SOME ENDEMIC SPECIES OF DIATOMS OF YUGOSLAVIA, (L'ULTRASTRUCTURE DES FRUSTULES DE QUELQUES ESPECES ENDEMIQUES DES DIATOMEES DE LA YOUGOSLAVIE),
Sarajevo Univ. (Yugoslavia). Faculty of Natural Science.
For primary bibliographic entry see Field 05A.
W73-05669

PRIMARY PRODUCTIVITY IN RARITAN BAY AND ITS RELATIONSHIP TO POLLUTION,
Rutgers - The State Univ., New Brunswick, N.J.
A. L. Bleecker.
Available from Univ. Microfilms, 300 No. Zeeb Rd., Ann Arbor, Mich. 48106. Order No. 72-811. Ph.D. Dissertation, 1971. 532 p.

Descriptors: *Primary productivity, *Sewage effluents, *Water pollution effects, Estuaries, Chlorophyll, Waste disposal, Waste water (Pollution), Pollutants, Water pollution, Effluents, Dystrophy, Biochemical oxygen demand, Estuarine environment, Sampling, Nutrients, Algae, Aquatic productivity, Environmental effects, Sewage, Water pollution sources, *New York.
Identifiers: *Raritan Bay, Rhodamine B.

Raritan Bay (New York Harbor area) which daily receives over 40 million gallons of effluents from the Middlesex sewer system, was studied to determine whether the bay was dystrophic. In situ primary productivity measurements over a two-year period were performed with a light and dark bottle rig. Rhodamine B, a dye tracer, was used to relate productivity and pollution influences. For the 1961 sample period gross production at a depth of 2 feet averaged 1.6 g C/cu m/24 hr, and the maximum value recorded was 4.4 g C/cu m/24 hr. The maximum unit area production recorded was 6.3 g C/cu m/24 hr and station means for the 1961 sample period ranged between 2.2 and 3.4 g C/cu m/24 hr. Minimal annual gross production was conservatively estimated at 440 g C/cu m which compares favorably with values for other estuaries which indicates pollution is promoting rather than inhibiting primary productivity. (Snyder-Battelle)
W73-05670

AIR POLLUTION: OUR ECOLOGICAL ALARM AND BLESSING IN DISGUISE,
California Univ., Livermore. Lawrence Livermore Lab.
H. W. Ellsaesser.
EOS, Transactions of American Geophysical Union, Vol 52, No 3, p 92-100, March 1971. 1 fig, 53 ref.

Descriptors: *Air pollution, *Balance of nature, *Ecology, Human population, Foods, Energy, Water supply, Pesticide toxicity, Solid wastes, Social aspects, Political constraints, Industrial production.
Identifiers: Ecological controls, Alarm.

The thesis is presented that air pollution is the one feedback signal of man's overgrazing of his ecological niche on earth which is capable of spreading an alarm in time to allow preventive action. Accelerated rates of population growth are compared with advances in agronomy, energy supply, fresh-water resources, supply of minerals, disposal of wastes, and various social and political problems. Much of the increased food supply results from use of pesticides and inorganic fertilizers which are causing problems. Nitrate buildup in water resources has become toxic to babies and plant life in some areas; silt is filling lakes and estuaries; and salination poses problems in ground and surface waters. Health hazards of air pollution are summarized and facts are given to show adverse levels of pollution in many parts of the world. It is concluded that if man is to attain rational solution to his overgrazing problem he must rely on technology and the scientific community that brought on the problem. (Lang-USGS)
W73-05695

INFLUENCE OF NUTRIENT POLLUTION LEVLES UPON ELEMENT CONSTITUION AND MORPHOLOGY OF ELODEA CANADENSIS RICH. IN MICHX,
Pennsylvania State Univ., University Park. Dept. of Biology.
F. S. Adams, D. R. MacKenzie, H. Cole, Jr., and M. W. Price.
Environ Pollut. Vol 1, No 4, p 285-298, 1971. Illus.
Identifiers: Aquatic plants, *Elodea-canadensis-M, *Emission spectrometry, Morphology, Nutrients, *Pennsylvania, Pollution, Spectrometry, Vegetation.

Systematic samplings from 24 stations in 2 Pennsylvania streams were analyzed chemically by emission spectrometry and morphologically by detailed measurements of several root, shoot, and leaf characteristics. These data were correlated statistically and compared to specific taxonomic descriptions and to 3 levels of environmental nutrient pollution. In general, the samples varied widely in element content and morphological charcteristics. Some of the morphological variation reported exceeds the conventional limits established for the species. Significant correlations were obtained that suggest causal relationships between concentration of certain element constituents and the levels of other elements detected, the concentration of specific element constituents and the expression of several morphological characters, and the expression of morphological characters one to another. A causal relationship between nutrient pollution and morphology is clearly indicated.--Copyright 1972, Biological Abstracts, Inc.
W73-05747

WATER SOLUBLE ORGANIC SUBSTANCES LEACHABLE FROM FEEDLOT MANURE,
Agricultural Research Service, Fort Collins, Colo.
For primary bibliographic entry see Field 05B.
W73-05783

CARBONIC ANHYDRASE INTERACTION WITH DDT, DDE, AND DIELDRIN,
Washington Univ., Seattle. Dept. of Chemistry.
For primary bibliographic entry see Field 05B.
W73-05797

SYSTEM SIMULATION TO TEST ENVIRONMENTAL POLICY: DDT,
Alfred P. Sloan School of Management, Cambridge, Mass.
For primary bibliographic entry see Field 05B.
W73-05817

SOME PROBLEMS OF MARINE TOXICITY STUDIES,
University of Strathclyde, Garelochhead (Scotland), Marine Lab.
E. J. Perkins.
Marine Pollution Bulletin, Vol. 3, No. 1, p 13-14, January 1972. 14 ref.

Descriptors: *Toxicity, *Laboratory tests, *Bioassay, Marine animals, Shrimp, Snails, Crabs, Water pollution effects, Animal physiology, Mollusks, Crustaceans, Gastropods.
Identifiers: *Error sources, Starfish, Macroinvertebrates, Sea urchins, *Laboratory techniques, Arthropods, Echinoderms, Dog whelk, Prawn, Thais (Nucella), Carinus, Psammechinus miliaris, Asterias rubens, Eupagarus bernhardus, Cragnon cragnon, Palaemon serratus, Littorina littorea, Littorina saxatilis.

Some of the pitfalls and precautions that must be observed in order to insure the quality of laboratory test animals for toxicity tests are presented. Handling procedures, collection methods, laboratory care, and physiological requirements of commonly used test organisms, such as snails, shrimp, starfish, crabs, prawns, mussels, sea urchins, and the dog whelk are discussed with the idea of improving toxicity test results by starting with really healthy animals instead of those which may already be dying due to improper treatment. Organisms discussed include Thais (Nucella), Carcinus, Pasammechinus miliaris, Asterias rubens, Eupagurus bernhardus, Cragnon cragnon, Palaemon serratus, Littorina littorea, and Littorina saxatilis. (Mackan-Battelle)
W73-05835

EFFECTS OF STEEL WORKS EFFLUENTS,
University of Strathclyde, Garelochhead (Scotland). Marine Lab.
E. J. Perkins.
Marine Pollution Bulletin, Vol. 3, No. 6, p 86-88, June 1972. 1 fig, 1 tab, 4 ref.

Descriptors: *Toxicity, *Effluents, *Industrial wastes, *Industrial plants, *Steel, *Water pollution effects, *Benthic fauna, *Benthic flora, Morality, Water pollution sources, On-site investigations, Marine algae, Gastropods, Mollusks, Sludge worms, Phaeophyta, Rhodophyta, Crustaceans, Annelids, Marine fish, Laboratory tests, Dredging, Spoil banks, Snails, Gastropods, Crabs, Kelps, Tubificides, Oligochaetes.
Identifiers: Coelenterates, Macroinvertebrates, Flatworms, Thais (Nucella), Buccinum undatum, Barnacles, Sea anemones, Starfish, Hydroids, Brittle star, Polychaetes, Echinoderms, Sandworms.

Both a field study and a laboratory toxicity study were conducted to ascertain the effects, if any, of effluents from a steel works in England upon benthic animals. The field study comprised hand and dredge sampling in the works area and other areas where no direct or significant influence from the effluents was likely. A relationship of increasing numbers and kinds of species to increasing depth and distance from the shore was apparent, but due to its generality could not be attributed to harmful effects of the effluents. A number of animals and plants flourished, even in direct contact with the waste flow. Laboratory toxicity tests showed that even sensitive organisms could live in the polluted area, provided no unusually large amounts of material with a toxicity greater than the tested samples were released. Chrome exposure tests did show coke oven effluent to be significantly more toxic than gas flame effluent, but when diluted was expected to do little damage. (Mackan-Battelle)
W73-05836

STUDIES OF A SIMPLE LABORATORY MICROECOSYSTEM: EFFECTS OF STRESS,
Georgia Univ., Athens. Dept. of Zoology.
M. C. Ferens, and R. J. Beyers.
Ecology, Vol. 53, No. 4, p 709-713, Summer 1972. 3 fig, 1 tab, 19 ref.

Descriptors: *Laboratory tests, *Stress, *Environmental effects, *Aquatic productivity, Ecosystems, Gamma rays, Biomass, Metabolism, Diurnal, Respiration, Pollutant identification, Irradiation, Biological communities, Aquatic life, Radioactivity effects, Sampling.
Identifiers: *Microcosms, *Species interaction, Chlorophyll a.

Inocula from an established microcosm were subjected to acute gamma radiation levels of 100,000 and 1,000,000 rads. Microcosms developed from these inocula were sampled through the 40-day successional period to determine effects of radiation stress. Chlorophyll a content, biomass, and community metabolism were measured by spectrophotometry, the particulate seston method, and by a standard method, respectively. Significant reduction in chlorophyll a was found when each treatment level was compared to its control. Biomass was significantly reduced throughout succession for both treatment levels except for the last sample of 1,000,000 rad microcosms. Net productivity and nighttime respiration varied similarly and were significantly reduced during early succession at both treatment levels. Comparison of treatment effects revealed that 100,000 rad level microcosms responded to the stress with a greater reduction in parameters measured than the 1,000,000. Explanation of this phenomenon may lie in inhibitory interactions among microcosm components at 100,000 rads. Elimination of certain species at 1,000,000 rads may have limited this interaction. The action of radiation at the community level was similar to that of other forms of stress in that radiation can differentially affect the organisms comprising a community and subsequently change community structure. The present study illustrates the idea that stress changes species dominants and succession. In addition, it emphasizes the significance of changes in interactions among community components when a community is stressed. (Byrd - Battelle)
W73-05839

PHOTOSYNTHETICALLY ELEVATED PH AS A FACTOR IN ZOOPLANKTON MORTALITY IN NUTRIENT ENRICHED PONDS,
Kansas Univ., Lawrence. Dept. of Systematics and Ecology.
W. J. O'Brien, and F.deNoyelles, Jr.
Ecology, Vol. 53, No. 4, p 605-614, Summer 1972. 7 fig, 1 tab, 47 ref.

Descriptors: *Photosynthesis, *Hydrogen ion concentration, *Zooplankton, *Nutrients, *Mortality, *Eutrophication, *Toxicity, Ponds, Freshwater, Phytoplankton, Fertilizers, Cultures, Water pollution effects, Limiting factors, Primary productivity, Filtration, Chlorophyta, Waterfleas, Aquatic animals, Cyanophyta, Plankton, Crustaceans, Daphnia.
Identifiers: *Survival, Ceriodaphnia reticulata, Life table technique, Daphnia pulex, Ankistrodesmus falcatus, Enrichment, Scenedesmus abundans, Scenedesmus quadricauda, Pandorina morum, Oocystis parva, Scenedesmus spp, Tetraspora lacustris, Pleodorina californica, Microcystis aeruginosa, Rhizoclonium.

During a nutrient enrichment study of eight small ponds, the mortality of crustacean zooplankton species was investigated using a life table technique. Representative zooplankton samples (Ceriodaphnia reticulata and Daphnia pulex) were collected and their dry weight biomass determined using an electrobalance. With that information and measurements of the size frequency distribution of these species, the population dry weight biomass could be estimated once the population density has been estimated. Standard life table experiments were used to test for toxic factors in medium nutrient level ponds. There was close agreement between high pH values and the disappearance of crustacean zooplankton in four of the highly fertilized ponds. Pond water containing phytoplankton was toxic to the dominant Ceriodaphnia reticulata, yet pond phytoplankton isolated from pond water and resuspended in dechlorinated tap water supported excellent growth of C. reticulata. Millipore-filtered pond water was not toxic. Analysis of chemical changes occurring in pond water with filtration showed a slight decrease in pH as the only significant alteration that is directly related to zooplankton mortality. The existence of such a pH mortality factor was demonstrated by testing the survivorship of newborn C. reticulata in artificially adjusted pH treatments. A change from pH 10.8 to 11.2 radically altered the survivorship. (Byrd-Battelle)
W73-05840

CONTAMINATION OF FRESH VEGETABLES AND CANAL WATER WITH SEWAGE IN CAIRO AREA,
Ain-Shams Univ., Cairo (Egypt). Faculty of Agriculture.
For primary bibliographic entry see Field 05B.
W73-05842

THE EFFECTS OF DIURNAL THERMOPERIOD TREATMENTS ON REPRODUCTIVE FUNCTION IN THE ESTUARINE GOBIID FISH, GILLICHTHYS MIRABILIS COOPER,
California Univ., Berkeley. Dept. of Zoology.
V. L. de Vlaming.
Journal of Experimental Marine Biology and Ecology, Vol 9, No 2, p 155-163, August 1972. 1 fig, 3 tab, 16 ref.

Descriptors: *Diurnal, *Thermoperiodism, *Estuaries, *Thermal stress, *Fish reproduction, Gonads, Sexual maturity, Water temperature, Water pollution effects, Fish populations, Brackish-water fish, Fish physiology, Fish behavior.
Identifiers: *Gobies, *Gillichthys mirabilis.

Experiments were conducted with the estuarine gobiid fish, Gillichthys mirabilis Cooper, in various stages of gonadal development to determine the effects of diurnal thermoperiod treatments (i.e., thermocycling) on the gonads; attention has been focused on the suppression of gonadal activity by high temperatures. Exposure to temperatures slightly above 24C for 7.5 hr a day is sufficient to induce gonadal regression. Shorter periods of heat treatment at temperatures above 24C cause gonadal regression. The gonadal response (regression) to thermoperiod does not depend upon the average daily temperature or the total heat 'dose', but rather the length of time spent at or above 24C. Longer exposures to a given high temperature are required to cause gonadal regression than are required to inhibit recrudescence. The results are compared with phenological and climatic data from the natural habitat of the fish. It is concluded that temperature acts as the primary proximate factor regulating reproductive cycling in this species, and that thermocycling experiments of the nature described here allow one to better predict the influence of the thermal environment on the physiology of the animal. (Byrd-Battelle)
W73-05843

DENSITY DEPENDENCE AND POPULATION REGULATION IN LABORATORY CULTURES OF PARAMECIUM,
Maryland Univ., College Park. Dept. of Zoology.
D. E. Gill.
Ecology, Vol 53, No 4, p 701-708, Summer 1972. 2 fig, 9 tab, 15 ref.

Descriptors: *Laboratory tests, *Cultures, *Dissolved oxygen, *Limiting factors, *Environmental effects, Protozoa, Nutrients, Sampling, Animal metabolism, Animal populations, Bioindicators.
Identifiers: *Paramecium, *Species density, *Metabolities, *Population density, Aerobacter aerogenes, Paramecium aurelia.

Two experiments with laboratory cultures of Paramecium were performed to test the hypotheses that (1) density is limited by food, and (2) dissolved oxygen in culture tubes of narrow shape is the primary limiting resource. The procedure of estimating saturation density was not repeatable over years and probably abnormally inflated the estimate of sampling error in the experiments. Differences observed between treatments were therefore of dubious biological significance. On the other hand, the estimates of intrinsic growth rates were reliable and repeatable. Contrary to expectation, all the species grew slower in food-enriched medium than in unenriched medium, and no effect of oxygen limitation could be demonstrated. It is concluded that population density regulation of paramecium is principally determined by accumulation of metabolic wastes of bacteria and the ciliates themselves. (Byrd-Battelle)
W73-05844

LIFE CYCLE OF POTAMOTHRIX HAMMONIENSIS (TUBIFICIDAE) IN THE PROFUNDAL OF A EUTROPHIC LAKE,
Copenhagen Univ. (Denmark). Freshwater Biological Lab.
P. M. Jonasson, and F. Thorhauge.
Oikos, Vol 23, No 2, p 151-158, 1972. 5 fig, 4 tab, 18 ref.

Descriptors: *Life cycles, *Profundal zone, *Tubificids, Reproduction, *Eutrophication, Light penetration, Aquatic environment, Aquatic insects, Dredging, Annelids, Water sampling, Oligochaetes, Benthic fauna, Growth stages, Embryonic growth stage, Immature growth stage.
Identifiers: *Potamothrix hammoniensis, *Lake Esrom, Macroinvertebrates, Chironomus anthracinus, Denmark.

A 250-sq cm Ekman dredge was used for quantitative sampling at a depth of 20 m where the bottom consists of a thick mud layer. The particle size is small (less than 0.15 nm) and the organic content is about 35-40 percent in the upper 10 cm of sediment. Numbers of Potamothrix hammoniensis (Michaelsen) varied between 10,000 and 25,000/sq m over six years (1954-1960) in the profundal of the eutrophic Lake Esrom, Denmark. Dry weight equivalents of preserved specimens varied between 0.75 and 1.80 g/sq m. Cocoons, deposited from late May to July, hatched in August. Growth was most rapid in autumn and spring and no weight increase occurred during summer stagnation. Reproductive individuals were, in some cases, three years old, but most were four. Total life span was at least five years. Reproduction of P. hammoniensis was related to numbers of Chironomus anthracinus Zett. When the Chironomus population was large the reproduction of P. hammoniensis was lowered. (Mackan-Battelle)
W73-05846

5D. Waste Treatment Processes

THE 'DEMAG' PROCESS--A PROCESS FOR REMOVAL OF TOXIC METAL IONS FROM WATER OR WASTEWATER,
Cornell Univ., Ithaca, N.Y. Water Resources and Marine Sciences Center.
R. K. Finn.
Available from the National Technical Information Service as PB-214 630, $3.00 in paper copy, $0.95 in microfiche. Water Resources and Marine Sciences Center Technical Report No. 46, 1972. 7 p, 2 fig, 8 ref. OWRR A-039-NY (1). 14-31-0001-3532.

Descriptors: *Mercury, *Waste water treatment, *Adsorption, Absorption, Yeasts, Isotherms, Magnesium, *Separation techniques, *Iron.

Mercury uptake by yeast cells depleted in iron and magnesium has been studied with a view to developing a biosorption process for removal of mercury. Enhanced uptake of mercuric ions was observed, but the results were not as dramatic as the 15-fold increase in uptake believed possible from related work in the literature. Yeast does adsorb mercury up to 1% of the dry cell weight. A most unusual finding is that the mercury content of the cells increased as the mercury content of the contacting solution was lowered from 20 ppm to 1 ppm. The fact that only a part of the mercury was reversibly bound suggests that more than one binding mechanism is operating. (Finn-Cornell)
W73-05207

PROJECTS OF THE MUNICIPAL TECHNOLOGY BRANCH THROUGH JUNE 1972,
Environmental Protection Agency, Washington, D.C. Office of Research and Monitoring.
W. A. Rosenkranz.
Copy available from GPO Sup Doc as EP1.23/2:72-080, $6.00; microfiche from NTIS as PB-214 759, $0.95. Environmental Protection Technology Series Report. EPA-R2-72-080, September, 1972. 556 p.

Descriptors: *Sewerage, *Municipal wastes, *Storm runoff, *Combined sewers, *Storm water, *Water quality control, *Dissolved solids, *Water pollution control, *Ultimate disposal, *Waste water treatment, *Water reuse, *Optimization, Instrumentation, Automation, Research and development.
Identifiers: *Cold climate research.

This report is a compilation of the information sheets on the 448 projects initiated since fiscal year 1967 through fiscal year 1972. The objectives, fiscal information and a brief description of the initiated project are contained on each sheet. Also presented is general information on the mission of the Municipal Technology Branch, its needs, problems, accomplishments, organization and

resources history. A listing is included of the new Program Element Numbers with the corresponding previous operating unit mission designations. (Smith-Texas)
W73-05212

THE SWIRL CONCENTRATOR AS A COMBINED SEWER OVERFLOW REGULATOR FACILITY,
National Environmental Research Center, Edison, N.J. Edison Water Quality Research Div.

Copy available from GPO Sup Doc as EP1.23/2:72-008, $2.25; microfiche from NTIS as PB-214 687, $0.95. Environmental Protection Technology Series Report. EPA-R2-72-008. September, 1972. 179 p, 33 fig, 5 tab, 14 ref. EPA Program 11023 GSC.

Descriptors: *Combined sewers, *Regulation, *Design criteria, *Mathematical models, Overflow, Separation techniques, Water treatment, Sewers, Solid wastes, *Waste water treatment.
Identifiers: *Overflow quantity, *Overflow quality, *Swirl concentrator.

A combined sewer overflow regulator which by induced hydraulic conditions separates settleable and floatable solids from the overflow was studied. A mathematical model was also prepared to determine a basis for design. The study also used a hydraulic model to determine swirl concentrator configurations, flow patterns and settleable solid removal efficiency. Excellent correlation was found between the two studies. It was found that at flows which simulate American experience a vortex flow pattern was not effective. However, when flows were restricted, a swirl action occurred and settleable solids were concentrated in the outflow to the interceptor in a flow of two to three percent as compared to the quantity of overflow through a central weir and down shaft. The swirl concentrator appears to offer a combined sewer overflow regulator that effectively regulates the flow and improves the quality of the overflow, with few moving parts. (Smith-Texas)
W73-05214

AIR MODULATED VACUUM OIL RECOVERY COLLECTION OF SPILLED OIL (FOAMS).
Environmental Protection Agency, Chicago, Ill. Region V.

Copy available from GPO Sup Doc as EP1.23/2:72-033, $0.75; microfiche from NTIS as PB-214 695, $0.95. Environmental Protection Technology Series Report No. EPA-R2-72-033, August, 1972. 57 p, 22 fig, 15 tab., 11 ref. EPA Program 15080-EHP.

Descriptors: *Oil spills, *Oil pollution, *Oil wastes, *Water pollution, Water treatment, Separation techniques, Water pollution control, Pollution abatement, Water pollution sources.
Identifiers: *Recovery techniques, *Oil skimming, *Air modulated vacuum recovery.

An air modulated vacuum oil recovery technique was developed in an experimental and engineering design project as a method of collecting oil spilled on water. The prototype device possessing a self contained power source proved capable of rapidly recovering thin slicks of oil (< 4 mm) from water surfaces with only a small amount of water present (< 10% by volume) in the recovered oil. The prototype recovered oil at the rate of 450 gal/hr for a thin oil slick. Thicker slicks could be recovered much more rapidly. (Smith-Texas)
W73-05217

POLYMER FILM OVERLAY SYSTEM FOR MERCURY CONTAMINATED SLUDGE-PHASE I,
Battelle Columbus Labs., Ohio.
For primary bibliographic entry see Field 05G.
W73-05218

WATER QUALITY CHARACTERISTICS OF STORM SEWER DISCHARGES AND COMBINED SEWER OVERFLOWS,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 05B.
W73-05333

THE UPTAKE OF PHOSPHORUS BY CERATOPHYLLUM DEMERSUM GROWING IN WASTEWATER,
Michigan State Univ., East Lansing. Dept. of Fisheries and Wildlife.
For primary bibliographic entry see Field 05C.
W73-05365

AERATION SYSTEMS FOR LARGE NAVIGABLE RIVERS,
Ohio River Div. Labs., Cincinnati.
A. G. Holler, Jr.
Proceedings of the American Society of Civil Engineers, Journal of the Sanitary Engineering Division, Vol 98, No SA4, p 678-679, 1972.

Descriptors: *Aeration, *Navigable rivers, Dissolved oxygen, Hydraulic structures, Ohio River, Turbulence, Gates, Control structures, Dams, Operating costs, Locks, Rivers.
Identifiers: Navigation structures.

Dissolved oxygen levels in large navigable rivers may be raised by improved reaeration at hydraulic structures already existing on the waterway. Surface turbulence on the discharge side of control gates at navigation dams is increased by gate operating procedures designed to produce increased stilling basin turbulence. An upper limit to the amount of turbulence permitted for a particular damming height is established based upon nonerosive velocity computations and by visual observations to insure that no adverse navigation currents result. There are 29 operating navigation structures on the Ohio River. The structures create lifts ranging from 7 ft to 37 ft. In terms of power the lifts represent a range of 794 hp to 4200 hp per 1000 cfs of water discharged through a dam. It is this power that is being utilized for reaeration purposes. In terms of oxygen transfer rates the figure starts at 220 lb/hr for every 1000-cfs discharge at a 7-ft lift structure and proceeds upward with increasing lifts and improved gate operating procedures. Thus, when considering aeration systems for large navigable rivers, contributions from existing resources should be maximized before considering supplemental aeration equipment. (Jones-Wisconsin)
W73-05369

MASTER SEWERAGE SYSTEM PLAN FOR METROPOLITAN MANILA,
Black and Veatch, Kansas City, Mo.
O. J. Schmidt.
Journal of the Sanitary Engineering Division, American Society of Civil Engineers, Vol 98, No SA1, p 125-152, February 1972. 8 fig, 13 tab.

Descriptors: *Municipal water, *Municipal wastes, *Sewerage, *Sewage disposal, *Sewage treatment, *Water quality, *Water pollution sources, *Planning, *Management, *Construction, Costs, Legislation, Administration, Sanitary engineering.
Identifiers: *Manila (Phillipines), Laguna de Bay.

A two year study to prepare a sanitary sewer system master plan for the Metropolitan Manila area was begun in 1967. The goals were: preparation of a master plan, with multiphase development for both long and short term programs; preparation of a feasibility report with engineering studies and cost estimates for a short term need; advice on treatment and disposal of industrial effluents; a thorough investigation of existing sewerage facilities to determine extent of repair and renovation; study of the relationship of this development plan to nearby Laguna de Bay connected to Manila Bay; study the national waterworks and sewerage authority; and recommendations concerning administrative, financial and legislative needs. The estimated cost of this study was $1,000,000 to be shared equally by the United Nations special fund and the Philippine government. The World Health Organization, Phillipine National Waterworks and Sewerage Authority, and Black and Veatch International will carry out the project. (Ensign-PAI)
W73-05417

INVESTIGATION AND DESIGN,
H. R. Oakley, and T. Cripps.
In: Symposium on Water Pollution Control in Coastal Areas, May 19-21, 1970, Bournemouth, England, The Institute of Water Pollution Control, London. p 64-86. 1970. 8 fig, 35 ref.

Descriptors: *Sewage disposal, *Waste treatment, *Design criteria, *Design standards, *Investigations, Costs, Methodology, Research and development.
Identifiers: *State-of-the-art review.

A state-of-the-art review of sewage and industrial effluent outfall schemes is presented. The overall objective of providing economic disposal of wastes without harm to amenity, health, or industry is viewed from several perspectives. Questions of economy, load factors, design parameters, and methodology are discussed. Waste treatment techniques, such as screens, maceration, flotation, and settlement are surveyed. An attempt is made to draw attention to the complexity of investigation and design of marine disposal schemes, the dangers of making generalizations, and the need to give full attention to the possibility of alternative courses of action in each case considered. Specific examples of several existing sewage disposal methods are cited and evaluated. (Ensign-PAI)
W73-05452

A REGIONAL SCHEME FOR THE DISPOSAL OF LONDON'S SLUDGE TO SEA,
Greater London Council (England). Dept. of Public Health Engineering.
S. H. Dainty, R. F. Pearson, L. H. Thompson, and E. V. Finn.
In: Symposium on Water Pollution Control in Coastal Areas, May 19-21, 1970, Bournemouth, England, The Institute of Water Pollution Control, London, p 87-102. 1970. 3 fig, 1 tab, 2 ref.

Descriptors: *Sludge disposal, *Outfall sewers, *Pipelines, Sludge treatment, Investigations, Coasts, Water pollution.
Identifiers: *Greater London Council (England), *Regional sewage-treatment plan.

The Greater London Council's plan for dealing with the problem of sludge disposal on a regional basis is described. The 620 square mile area encompassed in the scheme is served by 18 sewage-treatment works. The Council initiated studies to determine if it was feasible to pump sludge from the Greater London Sewerage Area by means of a submarine pipeline to a particular disposal point. The salient features of these investigations are presented in some detail. The outcome of the studies showed that it was feasible, at least from an engineering standpoint, to lay a pipeline from a land station to a point 8 nautical miles from the coast. It was also determined that the chance of extensive accretion in the vicinity of the proposed outfall was remote. Lastly, it was concluded that there would be a non measurable pollution increase on nearby beaches, provided all floatables were removed from the sludge before discharge. (Ensign-PAI)
W73-05453

WHERE DO WE GO FROM HERE.
A. Key.
In: Symposium on Water Pollution Control in Coastal Areas, May 19-21, 1970, Bournemouth, England, The Institute of Water Pollution Control, London. p 111-126. 6 ref.

Descriptors: *Sewage disposal, *Sewage treatment, *Future planning, *Outfall sewers, Water quality standards, Shores, Costs, Water pollution.
Identifiers: *Coliform count.

A brief look at existing conditions in the area of sewage disposal is given, followed by some suggestions and reflections on possible future policies. Advantages and disadvantages of the different means of pollution control, including cost factors are discussed. The best solution lies in the direction of longer outfalls rather than treatment plants. Criteria of quality are discussed with regard to the possibility of determining a standard against which shore pollution could be judged. A possible standard would be 1000 coliforms/100 ml, with not more than 10 per cent of samples out of a minimum of 100 taken systematically giving figures greater than that. In the future greater use will be made of screens, disintegration, comminution and macerating pumps as techniques for preventing discharge of gross solids. (Ensign-PAI)
W73-05455

PLANNING, TESTING, AND DESIGN FOR WATER RECLAMATION FOR LOS ANGELES,
Los Angeles Dept. of Water and Power, Calif.
R. D. Bargman, G. W. Adrian, and D. C. Tillman.
Paper, American Society of Civil Engineers National Water Resources Engineering Meeting, Jan 29 - Feb. 2, 1973, Wash., D.C. 22 p, 7 ref.

Descriptors: *Water reuse, *Water conservation, *Tertiary treatment, *Planning, Cities, California, Water supply, Pilot plants, Aquifer management, Municipal water, Cooling water.
Identifiers: *Water reclamation, *Los Angeles, *Los Angeles waste water system, Aquifer injection, Sea water barrier, Percolation spreading basins.

Because of its location in a semi-arid region where the bulk of its water resources must be imported, the City of Los Angeles has been studying water reclamation on pilot plant and small operational scales since 1927. The increasing cost of imported waters with the stabilization in waste water quality arising from excellent source control and reliable treatment processes have made reuse possible in certain specific cases. Determination of such specific reuse is dependent upon factors such as economic competitiveness with other sources, quality needs, treatment available, governmental approval, and phychological acceptability to the public. In the City of Los Angeles these factors are now such that design and construction leading towards large scale reclamation for uses such as aquifer injection as a sea water barrier, surface spreading for water supply augmentation, industrial cooling, and park irrigation are now underway. The Official Master Plan adopted by the governing body incorporates such specific cases of water reclamation as an important part of the total water resource. (OWRR)
W73-05583

DISPOSAL OF WATER-TREATMENT-PLANT WASTES.
American Water Works Association, New York. Committee on Disposal of Water Treatment Plant Wastes.

Journal of the American Water Works Association, Vol 64, p 814-820, December 1972. 4 fig, 2 tab, 22 ref.

Descriptors: *Water pollution sources, *Waste water treatment, *Waste water disposal, *Wastes, Water pollution, Treatment facilities, Byproducts, Sludge, Sludge treatment, Industrial wastes, Sludge disposal, Impaired water quality, Water pollution control, Pollutants.

Much research has been done to find acceptable methods for disposal of water-treatment-plant wastes. Among the directions toward a solution are: (1) selection or modification of treatment process so as to produce a minimum of waste materials, (2) processing of wastes to recover treatment chemicals and water for use, (3) processing of wastes to produce useful by-products, (4) processing of wastes to produce the most acceptable forms and minimal quantities of residue for ultimate disposal and (5) investigation of new methods and places for ultimate disposal of wastes. These suggestions and several others are discussed. The conclusion is that before the problem can be successfully solved, considerable standardization will be necessary. (Reed-Florida)
W73-05601

SOME GUIDELINES FOR SIZING MECHANICAL AERATORS,
ECS, Inc., Bryn Mawr, Pa. Environmental Control Systems Div.
F. V. Frissora.
Water and Sewage Works, Vol 119, No 8, p R-132/R-135, August, 1972. 5 tab, 3 ref.

Descriptors: *Treatment facilities, *Aeration, *Oxygenation, *Settling basins, *Suspended solids, *Mixing, *Waste water treatment, Water treatment, Temperature, Domestic sewage.
Identifiers: Altitude.

Guidelines are offered that will in most cases prove safe in sizing activated sludge waste treatment facilities. Only the high grade systems such as conventional activated sludge, contact stabilization and the like, where the MLSS are carried in a high concentration were considered. After the oxygenation requirement was established, the horsepower of the aerator could be determined. Besides also considering basin size and depth, guidelines are given for altitude corrections and temperature requirements. (Smith-Texas)
W73-05619

BASIC PRINCIPLES OF AERATION TANK DESIGN,
Institut fuer Wasserversorgung, Vienna (Austria).
W. Von Der Emde.
Water Research, Vol 6, p 397-399, 1972. 2 fig.

Descriptors: *Aeration, *Design criteria, *Cost analysis, *Cost comparison, *Waste water treatment, Biochemical oxygen demand, Sludge treatment, Nitrification, Economics.

Aeration tank design may be based on the specific BOD load or on the sludge load. The sludge load design should be checked to avoid exceeding the specific BOD load, whereas in the BOD design, the minimum aeration time should not be reduced for diluted waste waters. A table gives a cost comparison including construction and operational costs for both designs. (Smith-Texas)
W73-05621

TO WHAT EXTENT ARE PRIMARY TANKS REQUIRED,
Institut fuer Wasserversorgung, Vienna (Austria).
W. Von Der Emde.
Water Research, Vol 6, p 395-396, 1972.

Descriptors: *Sewage treatment, *Sludge digestion, *Sludge treatment, *Aeration, *Cost comparison, Cost analysis, *Waste water treatment, Treatment facilities, Settling basins.
Identifiers: *Primary treatment tanks.

Operational and economical advantages and disadvantages of sewage treatment with and without primary tanks are described. The advantages evident without primary tanks are: (1) simple operation, (2) equalization of sludge in aeration tanks, (3) storage for sludge in aeration tanks, without odor, (4) sludge withdrawal at one point only, and (5) further processing of sludge becomes possible. Disadvantages to having no primary tanks include: (1) higher energy consumption for aeration, (2) lower gas yield on sludge digestion, (3) operational difficulties, and (4) reduced capacity for thickening of the excess sludge. (Smith-Texas)
W73-05622

PUMPING STATIONS,
Kraus, Schanzlin and Becker A. G., Frankenthal (West Germany).
H. Weinrich.
Water Research, Vol 6, p 387-389, 1972. 2 fig.

Descriptors: *Pumping, *Pumps, *Centrifugal pumps, Hydraulic equipment, Waste water treatment, Water conveyance, Sludge treatment, Economics, Pipes.
Identifiers: *Screw conveyors.

Pump placement in a sewage treatment system is important, since the placement effects the coagulation of the sewage. The placement has less importance if a screw conveyor or a slow-speed pump is used in order to handle the untreated sewage carefully. These pumps not only prevent gas loss in sludge and prevent material in the sludge from twisting or bunching, but they also need no pre-screening, hence, they are more economical. (Smith-Texas)
W73-05623

ON THE CONSTRUCTION OF LARGE SCREENS,
Ruhrverband, Essen (West Germany).
For primary bibliographic entry see Field 05G.
W73-05624

EFFICIENCY OF A GRIT CHAMBER,
Ruhrverband, Essen (West Germany).
G. W. Annen.
Water Research, Vol 6, p 393-394, 1972. 2 fig.

Descriptors: *Operations research, *Efficiencies, *Sludge digestion, *Waste water treatment, Sand.
Identifiers: *Grit chambers.

A method was developed to determine the total efficiency of a grit chamber. Given the total weight of sand used per month and the concentration found in the sludge at the end of one month, the efficiency was then calculated. The method described can be generally applied to determine the efficiency of a grit chamber under operating conditions. (Smith-Texas)
W73-05625

DAN REGION SEWAGE RECLAMATION PROJECT,
Mekorot Water Co., Tel-Aviv (Israel).
M. Kremer.
Water Research, Vol 6, p 351-356, 1972. 4 fig, 1 tab.

Descriptors: *Sewage disposal, *Sewage lagoons, *Sewage treatment, *Water reuse, *Reclaimed water, Waste water treatment, Settling basins, Aeration, Biochemical oxygen demand, Chemical oxygen demand, Municipal sewage, Cost analysis, Cost comparisons.
Identifiers: *Israel, *Tel Aviv.

The Dan Region Sewage Reclamation Project was undertaken to solve the problem of sewage disposal and to reuse the reclaimed water of seven towns of the Greater Tel Aviv area. The system will be operated on the basis of facultative recircu-

lated aerobic ponds. This method is cheaper than plants using mechanical equipment where both investment and operating costs are high. Another advantage of the system is the fact that the long detention time of the sewage permits accurate control and a quality check before the effluent reaches the stage of tertiary treatment and recharge to the groundwater. (Smith-Texas)
W73-05627

DISTILLATION OF M AND O PROBLEMS. EPA-REGION VII,
Environmental Protection Agency, Kansas City, Mo. Region VII.
J. M. Rademacher.
Water Research, Vol 6, p 369-370, 1972.

Descriptors: *Treatment facilities, *Operation and maintenance, *Waste water treatment, Design criteria, Maintenance, Design, Equipment, Maintenance costs, Operating costs.
Identifiers: *Environmental Protection Agency.

Twenty-six different maintenance and operation problems encountered in waste water treatment plants and related facilities are listed. (Smith-Texas)
W73-05628

EVALUATION OF DESIGN DATA,
R. Kayser.
Water Research, Vol 6, p 335-337, 1972. 3 fig, 1 tab.

Descriptors: *Design criteria, *Biochemical oxygen demand, *Treatment facilities, Project planning, Projections, Probability, Waste water treatment.

Basic design data were determined for the expansion of a treatment plant in Northern Germany. The design criteria were based on BOD loading trends, and projections were made for 20 years. It was recommended that analyses of sewage flow and concentration be made on a continuous schedule. Furthermore, if the period between the evaluation of design data and plant construction is longer than 5 years the design data may have to be modified. (Smith-Texas)
W73-05630

CARROUSEL, A NEW TYPE OF AERATION SYSTEM WITH LOW ORGANIC LOAD,
Technische Hogeschool, Delft (Netherlands).
A. C. J. Koot, and J. Zeper.
Water Research, Vol 6, p 401-406, 1972. 5 fig, 1 ref.

Descriptors: *Aeration, *Design criteria, *Treatment facilities, *Cost analysis, *Mathematical models, *Turbulent flow, Activated sludge, *Waste water treatment, Sludge treatment, Oxidation lagoons, Economics.
Identifiers: *Carrousel system, *Energy requirements.

To fulfill the present trend in waste treatment plants- large plants are cheaper to build and more economical to operate per capita-elements such as the oxidation ditch process must be increased in size. With this in mind, the concept of the Carrousel was introduced to provide deeper and wider-aeration channels with adequate turbulence in order to maintain treatment efficiency. This system allows oxygen to be transferred into a limited aeration zone of the tank in the normal way, but also introduces a turbulent flow throughout the remainder of the tank. Energy requirements and design criteria are included. (Smith-Texas)
W73-05631

RAW SLUDGE COMBUSTION OR LIQUID DIGESTED SLUDGE DISPOSAL,
Technische Hochschule, Vienna (Austria).
For primary bibliographic entry see Field 05E.
W73-05632

PASTEURIZATION OF RAW AND DIGESTED SLUDGE,
Niersverband, Viersen (West Germany).
G. Kugel.
Water Research, Vol 6, p 561-563, 1972. 2 fig, 5 ref.

Descriptors: *Sludge treatment, *Sludge disposal, *Cost analysis, *Pasture management, Waste disposal, Ultimate disposal, Heat treatment.
Identifiers: *Pasteurization, *Thermal treatment.

Installations are described for the thermal treatment of liquid sludge in order to render it hygenic to handle before irrigating pasture land. In addition to a cost analysis, diagrams of discontinuous and continuous installations are included. (Smith-Texas)
W73-05633

CADMIUM, CHROMIUM, LEAD, MERCURY: A PLENARY ACCOUNT FOR WATER POLLUTION, PART 2-REMOVAL TECHNIQUES,
P. N. Cheremisinoff, and Y. H. Habib.
Water and Sewage Works, Vol 119, No 8, p 46-51, August, 1972. 8 fig, 2 tab, 2 ref.

Descriptors: *Heavy metals, *Lead, *Mercury, *Chromium, *Cadmium, *Separation techniques, Waste water treatment, Industrial wastes, Chemical wastes, Pollution abatement, Water quality control, Water pollution sources.
Identifiers: *Osaka Soda process, *Ventron system.

Various techniques, conventional and new, for the removal of cadmium, chromium, lead and mercury from wastewaters are described. Precipitation as hydroxides and anion exchange systems are the two common techniques for the removal of lead and cadmium. Removal of chromium through precipitation is a common technique. Sometimes an economical method, based on flow rates, and contaminant loadings of the wastewaters, ion exchange is also discussed with regard to removal of chromium. The reduction of mercury usage in mercury cells by modifications in the plant design is the current technique that is followed to remove mercury from wastewaters. Also mentioned are: (1) the Osaka Soda Process, and (2) the Ventron system; both are described as effective methods to reduce contents of mercury from effluents. (Morparia-Texas)
W73-05634

LIQUID SLUDGE DISPOSAL,
Niersverband, Viersen (West Germany).
G. Kugel.
Water Research, Vol 6, p 555-560, 1972. 5 fig, 3 ref.

Descriptors: *Sludge disposal, *Land reclamation, *Sludge, *Cost analysis, Transportation, Waste treatment, Industrial wastes, Agriculture, Municipal wastes, Spraying.
Identifiers: *Niersverband, Viersen.

Agricultural disposal of liquid sludge was studied. The efficiency and economics of the program are presented through a cost analysis approach and by means of a discussion of the disposal and transportation system. (Smith-Texas)
W73-05635

SYSTEMS ENGINEERING APPLIED TO A NEW LOS ANGELES PLANT,
Los Angeles City Engineers Dept., Calif.
D. C. Tillman.
Water Research, Vol 6, p 617-618, 1972.

Descriptors: *Systematics, *Waste water treatment, *Treatment facilities, *Design criteria, *Training, Engineering personnel, Project life, Monitoring.
Identifiers: *Systems engineering.

The City of Los Angeles' first attempt at systems engineering was applied to a major project, a water reclamation plant. The three basic steps followed were: (1) management must decide to use systems approaches and then enforce their use; (2) design personnel must be trained in the technique, and (3) continuous monitoring of the system and management control of major decisions are mandatory for success. (Smith-Texas)
W73-05636

SEWAGE TREATMENT AND DISPOSAL--CANNES WORKS, FRANCE.

Water and Water Engineering, Vol 76, No 918, p 304, August, 1972.

Descriptors: *Waste disposal, *Sewage disposal, *Pipelines, *Sewage treatment, Sewage effluents, *Outfall sewers, Waste water treatment.
Identifiers: *France, Cannes, Royal Adriaan Volker Group.

Cannes, French Riviera, has awarded a large contract to a member of the Royal Adriaan Volker Group for the construction of a sewage outfall pipeline. It is believed that the pipeline is the first of its size ever laid at such a depth. (Smith-Texas)
W73-05637

SEWAGE TREATMENT AND DISPOSAL-SADDLEWORTH UDC'S GREENFIELD WORKS.

Water and Water Engineering, Vol 76, No 918, p 304, August, 1972.

Descriptors: *Treatment facilities, *Sludge treatment, *Sludge disposal, *Waste water treatment, *Sewage treatment, Industrial wastes, Cost analysis, Activated sludge, Dewatering, Pulp and paper industry.
Identifiers: Saddleworth UDC, Yorkshire.

Extensions recently completed at Greenfield Sewage Works for Saddleworth UDC, Yorkshire make provision for a total dry weather flow of 1.67 mgd, which includes trade effluent from a paper mill amounting to almost 0.7 mgd. Johnson-Progress Ltd. provided for a sludge treatment plant that would treat 11,200 lb of dry solids a day when operated over a five day week. (Smith-Texas)
W73-05639

SEWAGE TREATMENT AND DISPOSAL-ITALY, CITY OF ROME'S NEW WORKS.

Water and Water Engineering, Vol 76, No 918, p 304, August 1972.

Descriptors: *Waste water treatment, *Sewage treatment, *Treatment facilities, Activated sludge, Sludge treatment, Chlorination, Cost analysis, Sedimentation, Settling basins, Filtration, Aeration, Operating costs.
Identifiers: *Chemical treatment, *Primary treatment, *Rome (Italy).

The Municipality of Rome has accepted the bid submitted by Pietro Aidonio SpA, for the construction of a large sewage treatment works for the area of Rome East. By sedimentation and the activated sludge process the works will allow full treatment to be given to a flow of 2.8 cu m/sec and primary treatment for seven cu m/sec. The supply of mechanical process equipment is being ordered from Simon-Hartley Ltd. and Johnson-Progress

Ltd. The initial phase of construction is scheduled for completion in early 1974. (Smith-Texas)
W73-05642

HEAVY METALS REMOVAL IN WASTEWATER TREATMENT PROCESSES: PART 2 - PILOT PLANT OPERATION,
Orange County Water District, Santa Ana, Calif.
D. G. Argo, and L. C. Gordon.
Water and Sewage Works, Vol 119, No 9, p 128-132, September 1972. 1 fig, 10 tab, 6 ref.

Descriptors: *Heavy metals, *Cadmium, *Chromium, *Zinc, *Copper, *Waste water treatment, Separation techniques, Treatment facilities, Filtration, Activated carbon, Coagulation, Lime, Tertiary treatment, Water quality control, Pollution abatement, *California.
Identifiers: Orange County (Calif).

Concentrations of cadmium, hexavalent chromium, zinc and copper were effectively reduced in the Orange County Water District's pilot plant treatment system of lime coagulation and settling, mixed media filtration and activated carbon adsorption. Removal efficiency appeared to be dependent on influent concentrations, with the lower removals always occurring when influent concentrations were very low. (Smith-Texas)
W73-05643

HYDRAULIC DESIGN OF SELF-CLEANING CIRCULAR SANITARY SEWERS,
West Virginia Inst. of Tech., Montgomery.
A. S. Paintal.
Water and Sewage Works, Vol 119, No 8, p R-52-R-60, August 1972. 12 fig, 10 ref.

Descriptors: *Sewers, *Flow, *Flow friction, *Turbulent boundary layers, *Flow characteristics, *Hydraulic design, Mannings equation, Hydraulic radius, Reynolds number, Shear stress, Shear drag, Boundary processes, Channel flow, Suspended solids, Mathematical methods, Roughness coefficient.

The object is to develop a procedure for determining hydraulic design of self-cleaning circular sanitary sewers and to establish a basis for hydraulic computations. Five conditions were found applicable based on the design procedure developed from the experimental information and analysis. They were: (1) the sewer to be designed will be essentially straight and circular in cross section, (2) the flow will be essentially uniform and can be described by the Manning formula, (3) the Manning roughness coefficient will depend upon the type of sewer material and the characteristics of the sewer boundary, (4) the critical boundary shear stress has been taken equal to 0.08 lb/sq.ft., and (5) at minimum flow conditions, the mean boundary shear stress will be taken equal to the assumed value of the critical shear stress. (Smith-Texas)
W73-05645

EDUCATIONAL SYSTEMS FOR PLANT OPERATORS,
Clemson Univ., S.C.
J. H. Austin.
Water Research, Vol 6, p 601-604, 1972. 2 tab, 15 ref.

Descriptors: *Treatment facilities, *Training, *Education, Employment opportunities, *Engineering personnel, Personnel, Waste water treatment.
Identifiers: Technicians.

Technicians with advanced training over and above the fundamentals required in older, relatively simpler plants are needed in the newer treatment facilities. The behavioral objective approach appears to have the greatest potential for the development of systematic training systems and guidance materials for wastewater treatment plant operators. (Smith-Texas)
W73-05649

A PILOT STUDY OF PHYSICAL-CHEMICAL TREATMENT OF THE RAW WASTEWATER AT THE WESTERLY PLANT IN CLEVELAND, OHIO,
Battelle-Northwest, Richland, Wash.
A. J. Shuckrow, W. F. Bonner, N. L. Presecan, and E. J. Kazmierczak.
Water Research, Vol 6, p 619-626, 1972. 2 fig, 2 tab.

Descriptors: *Industrial wastes, *Waste treatment, *Waste water treatment, Pilot plants, Sludge treatment, Sludge disposal, Filtration, Dewatering, Lime, Disinfection, Phosphates, Water quality control, Hydrogen ion concentration, *Ohio.
Identifiers: *Chemical treatment, *Cleveland (Ohio), Recarbonation.

Pilot plant operations demonstrated that a high quality effluent can be produced from raw sewage at the Westerly plant in Cleveland by a physical-chemical system employing lime clarification, recarbonation, filtration, granular carbon sorption, and disinfection. Included is a pilot plant description and details concerning sludge dewatering and disposal. (Smith-Texas)
W73-05651

CONTROL SYSTEMS FOR WASTEWATER TREATMENT PLANTS,
Clemson Univ., S.C.
J. F. Andrews.
Water Research, Vol 6, p 575-582, 1972. 6 fig, 14 ref.

Descriptors: *Treatment facilities, *Waste water treatment, *Control systems, *Systems analysis, *Cost comparisons, Design criteria, Economics, Waste treatment, Industrial wastes, Computers.

Control systems which may be used in future waste water treatment plant designs are reviewed. Some systems reviewed are (1) local automatic control, (2) centralized automatic control, and (3) computer process control. It is more economical to use modern control systems than to expend more money for additional plants. (Smith-Texas)
W73-05652

COMPUTER CONTROL-ARAKAWA TREATMENT PLANT,
Association of Ara-River Basin-Wide Sewage Works, Tokyo (Japan).
S. Tohyama.
Water Research, Vol 6, p 591-595, 1972. 2 fig.

Descriptors: *Waste water treatment, *Treatment facilities, *Automation, *Control systems, Management, Cost analysis, Water quality control, Economics, Operating costs.
Identifiers: *Arakawa, *Tokyo.

Computer control in the Arakawa Treatment Plant has served to (1) save manpower, (2) decrease operating cost, (3) high-grade wastewater quality and quantity, (4) provide a management system for the electric department, instrument department, and water quality department, and (5) predict incoming shore water quality and quantity. (Smith-Texas)
W73-05653

NEW TREATMENT PLANT INSTALLATIONS.
Suburbia Systems, Inc., Leawood, Kans.

Water and Sewage Works, Vol 119, No 9, p R-64/R-65, August 1972.

Descriptors: *Treatment facilities, *Waste water treatment, Water treatment, Aeration, Activated sludge, Sludge treatment, Municipal wastes, Design criteria, *Kansas, *Missouri.

A brief written and photographic description of four recently built wastewater treatment plants located in Kansas and Missouri is given. (Smith-Texas)
W73-05654

POTASSIUM PERMANGANATE: USE IN POTABLE WATER TREATMENT,
Carus Chemical Co., LaSalle, Ill.
For primary bibliographic entry see Field 05F.
W73-05656

AUTOMATIC CONTROL SYSTEMS,
West Hertfordshire Main Drainage Authority, Rickmansworth (England).
R. Wood.
Water Research, Vol 6, p 583-585, 1972.

Descriptors: *Waste water treatment, *Automation, *Control systems, Sludge digestion, Sludge treatment, Pumping, Sedimentation, Tertiary treatment, Treatment facilities.

A sewage treatment plant to be built in South-East England will be entirely automatically operated. This includes pumping, preliminary treatment, sedimentation, activated sludge treatment, tertiary treatment, sludge consolidation and sludge digestion. The 42 acre site can then be operated by 13 personnel. (Smith-Texas)
W73-05657

KINETICS OF CHLORINE DISINFECTION IN ALGAL-BACTERIAL SYSTEMS,
California Univ., Berkeley.
L. W. Hom.
Available from Univ. Microfilms, 300 N. Zeeb Rd., Ann Arbor, Mich. 48106 Order No. 71-15,790. Ph. D. Dissertation, 1970.

Descriptors: *Algae, *Chlorination, *Waste water treatment, Coliforms, Biochemical oxygen demand, Mathematical model, Waste treatment, Settling basins, Analysis.
Identifiers: *Chlorine dosage, Chemical treatment.

Unicellular green algae in waste pond effluents complicate effective chlorination. Both pure and mixed algal cultures from samples of actual pond effluents were used to develop analytical models to test for: (1) effect of type of organism on chlorine treatment, (2) effect of chlorine treatment on coliform bacteria, and (3) effect of chlorine on residual BOD in chlorinated algal-bacterial systems. The parameters studied were coliform concentration, chlorine dosage, time, algal concentration, and algal type. A mathematical model was developed to describe the effect of chlorine treatment on coliform bacteria in algal-bacterial systems. Results indicated that selective or differential chlorination can be achieved under controlled conditions whereby indicator coliform bacteria are destroyed but most algae are left intact. (Murphy-Texas)
W73-05659

MASS CULTURE OF A BLUE-GREEN ALGA IN CONTROLLED LIGHT-DARK REACTOR SYSTEMS,
Michigan Univ., Ann Arbor.
For primary bibliographic entry see Field 05C.
W73-05661

A STUDY OF THE AEROBIC TREATMENT CHARACTERISTICS OF THE RAFFINATES FROM A REVERSE OSMOSIS WASTEWATER RECLAMATION PLANT,
New Mexico Univ., Albuquerque.
J. C. Jennett.

Available from University Microfilms, 300 N. Zeeb Rd., Ann Arbor, Mich. 48106,. Order No. 70-12,398, Xeros Copy $6.00, Microfilm $4.00. Ph. D. Dissertation, 1969. 121 p.

Descriptors: Reverse osmosis, *Activated sludge, Mathematical studies, Design criteria, Recycling, Water reuse, *Waste water treatment, Filtration.
Identifiers: *Flow reactor.

The reverse osmosis process presents a promising method of reclaiming waste water. Equations were developed for the design of an activated sludge plant operating on the reverse osmosis raffinates. The constants in the design equations were evaluated from the results of batch experiments. The resulting equations were checked against continuous flow activated sludge plant parameters and were found to accurately predict the action of a continuous flow reactor. The experimental results indicated that the wastes produced in a reverse osmosis reclamation plant were treatable by the activated sludge process. (Murphy-Texas)
W73-05662

THE EFFECT OF SLUDGE CHARACTERISTICS UPON THE FLOTATION OF BULKED ACTIVATED SLUDGE,
Illinois Univ., Urbana.
R. F. Wood.
Available from University Microfilms 300, N. Zeeb Rd., Ann Arbor, Mich. 48106,. Order No. 71-15,003,. Ph. D. Dissertation, 1970. 155 p.

Descriptors: *Activated sludge, *Flow, *Flotation, Water treatment, Mechanical properties, Nitrogen, Carbon, *Waste water treatment.
Identifiers: Batch flux analysis, Morphological properties, Interfacial rise.

This study investigated some of the properties of bulked activated sludge and the relationship of these properties to the flotation behavior of the sludges; and it investigated the possibility of using batch flux analysis as a method of predicting results of the operation to continuous flow flotation units. Of the sludge characteristics studied, the rheological properties correlated the best with the flotation behavior of sludges because rheological properties reflect the morphological characteristics of the microorganisms which made up the sludge floc. The batch flux method of analysis accurately predicted the float concentrations obtained from a continuous unit in some cases but was not always satisfactory. (Albert-Texas)
W73-05663

OPTIMAL WASTE TREATMENT PLANT DESIGN UNDER UNCERTAINTY,
Wisconsin Univ., Madison.
P.Mac Berthouex.
Available from University Microfilms 300 N. Zeeb Rd., Ann Arbor, Mich. 48106. Order No. 70-8263, Xerox Copy $14.40, Microfilm $4.10. Ph. D. Dissertation, 1970. 319 p.

Descriptors: *Design criteria, *Optimization, *Treatment facilities, Activated sludge, *Waste water treatment, Biochemical oxygen demand, Reliability, Cost analysis, Mathematical studies.

The optimization method was applied to a variety of situations to investigate the sensitivity of the optimal design to changes in design parameters and to changes in the degree of uncertainty of key parameters. The final clarifier was shown to be a critical process. It was also shown that imposing a low activated sludge process loading constraint increases the cost of the system substantially. The effect of uncertainty in BOD removal rate is greatest when the rate is low. This research shows that the optimization method can produce the desired safety margins while achieving an economic balance based on the relative reliability, cost, and treatment capabilities of the system components. (Anderson-Texas)
W73-05664

THE SOIL AS A RESOURCE RENOVATOR,
Department of Agriculture, Washington, D.C.
J. O. Evans.
Environmental Science and Technology, Vol 4, No 9, p 732-735, September 1970. 3 fig, 6 ref.

Descriptors: *Waste disposal, *Waste treatment, Sewage disposal, Sanitary engineering, Municipal wastes, Organic wastes, Sewage, Water pollution, *Water reuse, *Recycling.

The use of surface soil to dispose of organic waste materials is explored. Not only cultivated land but also range and forested areas should be considered. A challenge for qualified personnel to reach the possibilities and develop further criteria is sounded. (Skogerboe-Colorado State)
W73-05736

A STATUS REPORT ON THE UTILISATION OF FREEZING IN DEWATERING OF SLUDGES,
Environmental Protection Agency, Cincinnati, Ohio. Advanced Waste Treatment Research Lab.
J. B. Farrell.
Proc. 13th International Congress of Refrigeration, Washington, D.C., 1971, Volume 1, p 739-743, 1971. 1 fig, 9 ref.

Descriptors: *Dewatering, *Freezing, *Thawing, *Sewage sludges, *Sludge treatment, Sludge disposal, Waste water treatment, Water treatment.
Identifiers: *Alum sludge, Iron hydroxide sludge, Freeze-thaw conditioning.

Slow freezing with subsequent thawing is an excellent means for conditioning sludges for dewatering. The process has been demonstrated for sewage sludges and for sludges produced in treating municipal water supplies. Results are superior to chemical conditioning. The character of the sludges is completely changed, and dewatering is extremely rapid. The change in properties is less striking for sewage sludges: the sludge must still be filtered and agitation will reverse the changes. Incorporation of freeze-thaw conditioning into processing sequences for dewatering sludges has achieved limited success. The limiting factors have been the need for slow, complete freezing, and for minimizing power required. Recent studies of continuous. freezing of sewage sludge on a steel belt showed impractically large plant size and high capital cost. It is unlikely that freeze-thaw conditioning will be adopted for dewatering sludges except for those cases where there is essentially no alternative. (EPA)
W73-05763

ECONOMIC ASPECTS OF SLUDGE DEWATERING AND DISPOSAL,
Colorado Univ., Boulder. Dept. of Civil and Environmental Engineering.
E. R. Bennett, D. A. Rein, and K. D. Linstedt.
Journal of the Environmental Engineering Division, American Society of Civil Engineers, Vol. 99, No. EE1, Paper 9537, p 55-72, February, 1973. 19 fig, 11 ref.

Descriptors: *Sludge disposal, *Dewatering, *Filtration, *Cost analysis, Environmental engineering, Sanitary engineering, Water pollution, Wastes, Incineration, Systems analysis, Waste treatment, *Waste water treatment.
Identifiers: *Vacuum filtration, Cake moisture, Filter leaf tests, Land disposal, Truck hauling.

Cost optimization of a sludge handling and disposal system which incorporates vacuum filtration has proven to be a difficult problem. Vacuum filtration, a mechanical dewatering method, is a unique process: Unfortunately, although the input cost can be accurately controlled through precise control of conditioning chemical additions, the output parameters do not behave in a highly predictable manner. The economics of sludge handling for large plants utilizing vacuum filtration and incineration or land disposal have been investigated using the total disposal system concept. Disposal systems costs were found to be most sensitive to vacuum filter cake moisture content. For this reason vacuum filtration studies were made with cake moisture being a major parameter as well as yield. Filter leaf tests and in-plant studies were made utilizing four different types of sludges: Raw primary; digested primary; activated; and a blend of the three previous types. It was found that sludge type, septicity, feed sludge solids content, and vacuum filter form time were the major parameters controlling the economics of vacuum filtration. Total disposal system economics were evaluated using vacuum filtration coupled with incineration and vacuum filtration followed by truck hauling and land disposal. (Bell-Cornell)
W73-05808

EVALUATION OF ALTERNATIVES FOR SOLID WASTE SYSTEMS,
Wisconsin Univ., Green Bay.
For primary bibliographic entry see Field 05E.
W73-05814

5E. Ultimate Disposal of Wastes

PROJECTS OF THE MUNICIPAL TECHNOLOGY BRANCH THROUGH JUNE 1972,
Environmental Protection Agency, Washington, D.C. Office of Research and Monitoring.
For primary bibliographic entry see Field 05D.
W73-05212

OCEAN DUMPING OF WASTE MATERIALS.

Hearings--Subcomm. on Fisheries and Wildlife Conservation--Comm. on Merchant Marine and Fisheries, United States House of Representatives, 92d Cong, 1st Sess, April 5, 6, 7, 1971. 553 p, 4 fig, 1 plate, 1 dwg, 11 tab, 70 ref.

Descriptors: *Waste disposal, *Permits, *Oceans, *Water pollution control, *Legal aspects, Federal jurisdiction, United States, Administrative agencies, Legislation, Penalties (Legal), Coasts, Great Lakes, Pollutants, State governments, Pollution abatement, Environmental effects, Water quality control, Sewage, Fish, Waste dumps, Navigable waters, Sewage sludge, Waste treatment, Water law.
Identifiers: *Congressional hearings, Territorial seas (Jurisdiction).

Hearings before the Subcommittee on Fisheries and Wildlife Conservation were held to consider a series of proposed bills designed to regulate the dumping of waste materials in ocean, coastal, and other waters such as the Great Lakes, under U.S. jurisdiction. H.R. 4723, the main bill under consideration, would bar the transportation of materials from the U.S. for dumping except as authorized by permits issued by the Environmental Protection Agency (EPA). The EPA would establish and apply criteria for evaluating dumping applications, and in establishing such criteria would consider whether such dumping would unreasonably endanger human health or the marine environment. The bill would not prohibit emergency dumping of materials to safeguard human life. Violations of the act would be subject to criminal and civil penalties. An alternative to the proposed bill included a complete ban on all ocean dumping, but it was feared this would cause undesirable environmental effects by forcing all disposal to land modes. Another alternative considered was that of placing greater responsibility on individual states to develop procedures for dumping. However, the proposed bill would effect greater uniformity of criteria and procedure. (Adams-Florida)
W73-05225

OCEAN DISPOSAL OF UNSERVICEABLE CHEMICAL MUNITIONS.

Hearings--Subcomm. on Oceanography--Comm. on Merchant Marine and Fisheries, U.S. House of Representatives, 91st Cong., August 3, 4, 6, 7, 1970. 342 p, 1 fig, 1 photo, 1 dwg, 2 tab.

Descriptors: *Waste disposal, *Chemical wastes, *Legislation, *Oceans, Water pollution, Pollutants, Atlantic Ocean, Public health, Safety, Water pollution effects, Hazards, Accidents, Storage, Legal aspects, Water pollution sources, Chemical warfare, Decision making, Disasters.
Identifiers: Coastal waters, National Environmental Policy Act.

The purpose of these hearings was to inquire into the disposal of concrete and steel vaults, containing rockets charged with GB nerve gas, in the deep waters of the Atlantic Ocean. The scope of the inquiry included the implication of the proposed move on the local, national and international levels, the degree to which the people and their elected representatives were brought into the decision making process and the requirements of the National Environmental Policy Act. Representatives of the Department of the Army, the Department of Health, Education and Welfare, the Naval Research Laboratory, the Department of State, the Atomic Energy Commission, the Federal Water Quality Administration, the Department of the Interior, the National Academy of Science, the Council on Environmental Quality, the Bureau of Commercial Fisheries, the U.S. Public Health Service and members of Congress made their views known to the Subcommittee. (Reed-Florida)
W73-05226

EXCHANGE PROCESSES BETWEEN PETPESWICK INLET AND CONTINENTAL SHELF WATERS, A PRELIMINARY REPORT,
Bedford Inst., Dartmouth (Nova Scotia). Atlantic Oceanographic Lab.
For primary bibliographic entry see Field 05B.
W73-05420

THE EFFECT OF KUWAIT CRUDE OIL AND A SOLVENT EMULSIFIER ON THE METABOLISM OF THE MARINE LICHEN LICHINA PYGMAEA,
Bristol Univ. (England). Dept. of Botany.
For primary bibliographic entry see Field 05C.
W73-05428

INVESTIGATION AND DESIGN,
For primary bibliographic entry see Field 05D.
W73-05452

A REGIONAL SCHEME FOR THE DISPOSAL OF LONDON'S SLUDGE TO SEA,
Greater London Council (England). Dept. of Public Health Engineering.
For primary bibliographic entry see Field 05D.
W73-05453

WHERE DO WE GO FROM HERE.
For primary bibliographic entry see Field 05D.
W73-05455

DEALING WITH MAJOR OIL SPILLS AT SEA,
British Petroleum Co. Ltd., London (England).
For primary bibliographic entry see Field 05G.
W73-05458

PRELIMINARY RESULTS OF INJECTING HIGHLY TREATED SEWAGE-PLANT EFFLUENT INTO A DEEP SAND AQUIFER AT BAY PARK, NEW YORK,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 05B.
W73-05471

DUMPING OF WASTE MATERIAL.
For primary bibliographic entry see Field 06E.
W73-05591

DISPOSAL OF WATER-TREATMENT-PLANT WASTES.
American Water Works Association, New York. Committee on Disposal of Water Treatment Plant Wastes.
For primary bibliographic entry see Field 05D.
W73-05601

RAW SLUDGE COMBUSTION OR LIQUID DIGESTED SLUDGE DISPOSAL,
Technische Hochschule, Vienna (Austria).
W. Von Der Emde, and W. Muller.
Water Research, Vol 6, p 565-567, 1972. 2 tab.

Descriptors: *Sludge disposal, *Sludge treatment, *Cost analysis, *Cost comparison, Ultimate disposal, Fertilizers, Land reclamation, Waste treatment, Heat treatment.
Identifiers: *Thermal treatment, Sludge combustion.

The following sludge disposal methods were evaluated for cost and pollution potential: (1) raw sludge combustion after thermal conditioning, (2) raw sludge combustion after chemical conditioning, (3) sludge digestion, pasteurization, and pumping, and (4) sludge digestion and disposal including own electricity generation. Sludge digestion, pasteurization and pumping was the least expensive and afforded little opportunity for air pollution. (Smith-Texas)
W73-05632

SLUDGE DISPOSAL AT SEA,
Philadelphia Water Dept., Pa.
C. F. Guarino.
Water Research, Vol 6, p 569-571, 1972. 1 tab.

Descriptors: *Sludge disposal, *Ultimate disposal, *Ocean currents, Sampling, Sludge treatment, Sewage disposal, Waste treatment, Transportation, Cost analysis, *Pennsylvania.
Identifiers: *Ocean dumping, *Philadelphia.

Philadelphia, Pennsylvania's present sludge disposal method is discussed, including a cost analysis. Because of increasing ecological awareness, sludge disposal at sea has come under review. Samples of the ocean water and sediment at the disposal site indicate that the area is not different from areas at a further distance from shore. Despite this information, the site will probably be moved further out to sea, thereby increasing the cost of disposal. (Smith-Texas)
W73-05658

HYDROGEOLOGIC EVALUATION OF A SANITARY LANDFILL IN PORTAGE COUNTY, OHIO,
Kent State Univ., Ohio. Dept. of Geology.
For primary bibliographic entry see Field 05B.
W73-05790

ECONOMIC ASPECTS OF SLUDGE DEWATERING AND DISPOSAL,
Colorado Univ., Boulder. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 05D.
W73-05808

EVALUATION OF ALTERNATIVES FOR SOLID WASTE SYSTEMS,
Wisconsin Univ., Green Bay.
R. B. Wenger, and C. R. Rhyner.
Journal of Environmental Systems, Vol 2, No 2, p 89-108, June, 1972. 4 fig, 3 tab, 17 ref.

Descriptors: *Waste disposal, Management, Evaluation, *Alternative planning, *Decision making, *Solid wastes, *Municipal wastes, *Stochastic processes, *Optimization, Systems analysis, Mathematical models, Feasibility, Costs, Uncertainty, Methodology, Recycling, Reclamation, Computer programs.
Identifiers: Engineering considerations, Economic consideration, Environmental factors, Social factors.

Traditional solid waste management practices of landfill dumping and incineration have been creating environmental hazards and public nuisances, and concerned citizens are calling for programs oriented toward recycling and reclamation. Rational decision-making procedures which consider environmental and social factors are needed. A methodology is presented that provides a consistent quantitative decision-making procedure for evaluating solid waste processing and disposal alternatives. The decision model incorporates environmental and social factors in addition to cost and engineering considerations. The method relies upon establishment of a data matrix for the criteria and alternatives under consideration and upon the assignment of weights to the various criteria. A stochastic procedure takes account of the inherent uncertainty in the quantitative values assigned to subjective criteria and for the uncertainty in the assigned weightings. An example demonstrates use of the method. Mathematical operations employed in the program are relatively simple. The methodology is advantageous because it: 1) forces decision-makers to formalize their thinking and concisely state their assumptions and evaluations of the relative importance of the factors; 2) incorporates the inherent uncertainty of some of the factors and assigned wieghts into the calculations; and 3) allows decision-makers to investigate the sensitivity of the results with respect to the importance of certain factors. (Bell-Cornell)
W73-05814

WATER PROBLEMS ASSOCIATED WITH OIL PRODUCTION IN ALABAMA,
Geological Survey of Alabama, Montgomery.
For primary bibliographic entry see Field 05B.
W73-05826

5F. Water Treatment and Quality Alteration

CONCENTRATION AND ANALYSIS OF PESTICIDES AND OTHER RECALCITRANT MOLECULES IN WATER SUPPLIES BY ULTRAFILTRATION (REVERSE OSMOSIS),
Cornell Univ., Ithaca, N.Y. Water Resources and Marine Sciences Center.
P. Schubert, and V. H. Edwards.
Available from the National Technical Information Service as PB-214 744, $3.00 in paper copy, $0.95 in microfiche. Water Resources and Marine Sciences Center Technical Report No. 48, 1972. 15p, 1 fig, 3 tab, 16 ref, append. OWRR A-032-NY (1). 14-31-0001-3232.

Descriptors: Analytical techniques, *Chlorinated hydrocarbon pesticides, *Pesticide removal, *Reverse osmosis, Semipermeable membranes, *Water treatment, Membranes, 2-4-D, Pollutant identification.

Reported are experiments to evaluate ultrafiltration or reverse osmosis as a method for removal of pesticides from water supplies and other aqueous solutions. The selectivity of five types of reverse osmosis membranes was determined for aqueous solutions of several derivatives of 2,4 dichlorophenoxyacetic acid (2,4-D). Large differences were noted in the retention properties of various commercial membranes. At feed concentrations of 50 ppm 2,4-D initial retentions of the sodium salt never exceeded 65% and declined to lower values ranging from 1% to 51% after passage

of a 5 cm. layer of solution, depending on the membrane. Adsorption to the membranes was partly responsible for the time-variant retention in two of the commercial membranes. Tests performed with laboratory-prepared tri-acetate membranes and with iron complexed forms of 2,4-D were also discouraging. Therefore, it does not seem likely that ultrafiltration can be used effectively as a means of complete removal or analysis of 2,4-D and its derivatives in water supplies, but partial removal of pesticide residues may be a beneficial side effect of water treatment by reverse osmosis, depending on the residue and the membrane used. These results may be useful in testing alternative theories for solute penetration of semipermeable membranes.
W73-05205

CHARACTERIZATION OF STREAM REAERATION CAPACITY,
Georgia Inst. of Tech., Atlanta.
E. C. Tsivoglou, and J. R. Wallace.
Copy available from GPO Sup Doc as EP1.23:72-012, $3.75; microfiche from NTIS as PB-214 649, $0.95. Environmental Protection Agency Ecological Research Series Reports EPA-R3-72-012, October 1972. 317 p, 71 fig., 28 tab., 24 ref., 4 append. EPA Program 16050 EDT.

Descriptors: *Reaeration, *Streams, *Stream pollution, *Streamflow hydraulics, *Tracers, *Radioisotopes, *Dissolved oxygen, Biochemical oxygen demand, Temperatures, Mathematical models, Model studies, Turbulent flow, Turbulence, Mixing.
Identifiers: *Stream self-purification, *Flint river, *South river, *Patuxent river, *Jackson river, *Chattahoochee river, *Gas transfer, *Stream hydraulic properties.

Research was conducted to characterize stream reaeration capacity in terms of the stream hydraulic properties and to develop procedures for evaluating the effects of pollutants on reaeration. A gaseous tracer procedure was used in the field studies for measurement of reaeration. Not only have these studies incorporated a wide range of hydraulic features, but also, the range of BOD's and temperatures encountered was large. Tests of observed vs. predicted values of K2 have shown that none of the available models is capable of providing dependable predictions of stream reaeration capacity, especially under highly turbulent flow conditions. A new model was derived that explains the reaeration capacity of a stream in terms of the rate of energy dissipation and furthermore, provides dependable predictions. The reaeration rate coefficient was shown to decrease with LAS and community wastes; remain constant with pure NTA; and increase with pure mineral oil. (Smith-Texas)
W73-05213

THE SWIRL CONCENTRATOR AS A COMBINED SEWER OVERFLOW REGULATOR FACILITY.
National Environmental Research Center, Edison, N.J. Edison Water Quality Research Div.
For primary bibliographic entry see Field 05D.
W73-05214

SALINE WATER CONVERSION PROGRAM.
For primary bibliographic entry see Field 03A.
W73-05221

FEDERAL RESEARCH IN POTABLE-WATER TECHNOLOGY--JOINT DISCUSSION,
For primary bibliographic entry see Field 05G.
W73-05232

ELIMINATION OF MYCOPLASMA CONTAMINANTS FROM VIRUS STOCKS BY TREATMENT WITH NONIONIC DETERGENTS,
Maryland Univ., College Park. Dept. of Microbiology.
For primary bibliographic entry see Field 05A.
W73-05288

THE MINERAL QUALITY PROBLEM IN THE COLORADO RIVER BASIN.
Environmental Protection Agency, San Francisco, Calif. Region IX; and Environmental Protection Agency, Denver, Colo. Region VIII.
For primary bibliographic entry see Field 05C.
W73-05353

DESALTING AS A SOURCE OF WATER SUPPLY,
Office of Saline Water, Washington, D.C.
For primary bibliographic entry see Field 03A.
W73-05602

REVERSE OSMOSIS-A TOOL FOR MODERN INDUSTRY,
Permutit Co., Paramus, N.J.
D. E. Hagstrom.
Water and Sewage Works, Vol 119, No 8, p R-108-R-116, August, 1972. 3 fig.

Descriptors: *Reverse osmosis, *Membrane processes, *Membranes, *Structural design, Design criteria, Saline water, Filtration, Cost analysis, Operating cost, Capital costs, Water quality control, Water treatment, Industrial water, Hydrogen ion concentration.
Identifiers: *Cellulose acetate, *Aromatic polyanide, Microbial hydrolysis.

Advances in membrane technology and suitable support structure for the membranes are the two basic developments in the reverse osmosis concept. Cellulose acetate membranes have given way to aromatic polyanide membranes because of difficulties with the lack of pH range and associated microbial hydrolysis. Furthermore, polyanide membranes can be processed as a hollow fiber and therefore, serves as its own support structure. The major attribute of reverse osmosis is simplicity of design. A cost analysis is included. (Smith-Texas)
W73-05640

SODIUM ZEOLITE FILTER SOLVES SPECIAL WATER CONDITIONING PROBLEMS.

Water and Sewage Works, Vol 119, No 9, p 136-137, September 1972. 4 fig.

Descriptors: *Water quality, *Water treatment, *Water softening, *Zeolites, Filtration, Sedimentation, Hardness (Water), *Tennessee.
Identifiers: Cumberland River.

Since every windshield at Ford's Nashville, Tennessee Glass Plant must be washed and rinsed with water of hardness precisely similar to the hardness of the water used prior to lamination, a water softening system was employed. The United Filter sodium zeolite system needs only occasional monitoring to guarantee the precise hardness level required. (Smith-Texas)
W73-05644

PROBLEMS AND SOLUTIONS IN LARGE SCALE EVAPORATION,
Catalytic, Inc., Philadelphia, Pa.
For primary bibliographic entry see Field 03A.
W73-05647

POTASSIUM PERMANGANATE: USE IN POTABLE WATER TREATMENT,
Carus Chemical Co., LaSalle, Ill.
L. D. Shrode.
Water and Sewage Works, Vol 119, No 8,.p R-10/R-19, August 1972. 5 fig.

Descriptors: Waste water treatment, *Water treatment, *Potassium compounds, *Iron, *Manganese, *Filtration, Hydrogen ion concentration, Treatment facilities, Sludge treatment, Chlorination, Aeration, Chemical reactions, Odor, Color, Taste, Economics.
Identifiers: *Chemical treatment.

Potassium permanganate has become widely accepted as a useful material for the removal of taste, odors, iron, manganese and color from raw water supplies because of its qualities as an oxidant, its versatility and its ability to function over a wide pH range. Numerous advantages of using KMnO4 are described including: (1) lower costs, (2) ease of handling, (3) ease of control, and (4) speed of reaction. (Smith-Texas)
W73-05656

A STATUS REPORT ON THE UTILISATION OF FREEZING IN DEWATERING OF SLUDGES,
Environmental Protection Agency, Cincinnati, Ohio. Advanced Waste Treatment Research Lab.
For primary bibliographic entry see Field 05D.
W73-05763

5G. Water Quality Control

PROJECTS OF THE MUNICIPAL TECHNOLOGY BRANCH THROUGH JUNE 1972,
Environmental Protection Agency, Washington, D.C. Office of Research and Monitoring.
For primary bibliographic entry see Field 05D.
W73-05212

CHARACTERIZATION OF STREAM REAERATION CAPACITY,
Georgia Inst. of Tech., Atlanta.
For primary bibliographic entry see Field 05F.
W73-05213

POLYMER FILM OVERLAY SYSTEM FOR MERCURY CONTAMINATED SLUDGE-PHASE I,
Battelle Columbus Labs., Ohio.
M. U. Widman, and M. M. Epstein.
Copy available from GPO Sup Doc as EP1:16:16080 HTZ05/72, $1.00; microfiche from NTIS as PB-214 688, $0.95. Environmental Protection Agency Water Pollution Control Research Series, May 1972. 79 p., 21 fig, 9 tab, 6 ref, 3 append. EPA Program 16080 HTZ 05/72. 68-01-0088.

Descriptors: *Mercury, *Pollution abatement, *Water pollution, *Public health, *Toxicity, Water pollution sources, Chemicals, Plastics, Polymers, Sediments, Cost analysis, Economics.
Identifiers: *Lake sediments, *Mercury compounds, *Nylon 6, *Polyethylene, *Mercury barriers, *Mercury pollution, Application equipment, Hot melts, Latices, Hydrocarbon polymers, Dimethyl mercury, Mercuric chloride.

Various polymer films to be used in sealing mercury contaminated sediments were studied. Materials were selected for detailed study on the basis of barrier properties to mercury compounds, strength, handleability, and estimated service life. Although most polymers are effective barriers to HgC12, the resistance to organic compounds can vary from poor to very good. Nylon 6 and high density polyethylene proved to be the most effective barriers to organic mercury. It was concluded that polymer films can be effectively utilized to seal mercury contaminated sediments. Estimated costs for film deployment are given and equipment concepts for film deployment were demonstrated. The nylon 6 system was recommended for field demonstration. (Smith-Texas)
W73-05218

ANTAGONISTIC RELATIONSHIP OF SOME FUNGI (FUNGI IMPERFECTI) TOWARDS PATHOGENIC BACTERIA IN THE STAVNJA RIVER (IN SERBO-CROATRAN),
Sarajevo Univ. (Yugoslavia). Bioloski Institut.
For primary bibliographic entry see Field 05C.
W73-05219

WATER: THE VITAL ESSENCE,
P. Briggs.
Harper and Row, Publishers, Inc., New York 1967. 223 p, 28 photo, 16 ref.

Descriptors: *Municipal wastes, *Water utilization, *Water pollution sources, *Waste water treatment, Water chemistry, Water conservation, Water pollution effects, Water pollution, Impaired water quality, Water purification, Waste water (Pollution), Oceanography, Oceans, Hydrologic aspects.

A selective history is presented of water and its relationship with man. From a chemical analysis of water to the hydrologic cycle and from the many sciences of oceanography to the economic profit from the sea, the importance of water to man is quite evident. The more modern concern of what is happening to water is also discussed. Several of the more newsworthy incidents of polluted water are chronicaled. The role of the Public Health Service in investigating and stopping polluters is traced. One big contributor to the water pollution problem is municipal sewage. Primary and secondary waste treatment helps to an extent but does not eliminate the pollution. New water technology is advancing new solutions to the problem. Developments in recycling and desalination may help in bringing about a solution. Actions of the Bureau of Reclamation in the Far West have helped in solving some of the water-related problems of those states. Many problems such as irrigation and pollution still exist, but technology can provide solutions. (Nielsen-Florida)
W73-05220

FEDERAL EVALUATION OF RIPARIAN PROPERTY: SECTION III OF THE RIVERS AND HARBORS ACT OF 1970,
For primary bibliographic entry see Field 06E.
W73-05223

NOTE: THE MINNESOTA POLLUTION CONTROL AGENCY--A STUDY IN STATE ADMINISTRATIVE LAW.
Minnesota Law Review, Vol 56, p 997-1119, 1972. 647 ref.

Descriptors: *Administrative agencies, *Administrative decisions, *Legal review, *Minnesota, Legislation, Water pollution, Legal aspects, Water pollution control, Judicial decisions, Constitutional law, Regulation, Permits, Law enforcement, Adjudication procedure, State governments, State jurisdiction.

The powers and duties of the Minnesota Pollution Control Agency (PCA) are examined, including the power and duty to make rules, to grant permits and variances, and to detect violations and enforce the laws and regulations in both formal and informal proceedings. The legislative, executive and judicial controls exercised over the agency are also discussed. The Pollution Control Agency does not have the financial resources to exercise some of its functions adequately. The PCA is governed by ambiguous statutes which make the exercise of its substantive powers unnecessarily difficult and also, the Agency has been hindered by an overzealous exercise of the court's powers of judicial review. Until the courts allow the PCA more discretion and the legislature clarifies the relevant statutory structure, the agency will be unable to effectuate its legislative mandate. (Reed-Florida)
W73-05224

EVERGLADES--BIG CYPRESS NATIONAL RECREATION AREA, PART II.
Hearings--Subcomm. on Parks and Recreation--Comm. on Interior and Insular Affairs, U.S. Senate, Ninety-second Congress, April 20, 21, 1972. 219 p, 7 fig, 1 plate, 4 map, 5 tab, 1 chart.

Descriptors: *Federal reservations, *Florida, *Legislation, *National recreation areas, Swamps, Jurisdiction, Water sources, Eminent domain, Public lands, Urbanization, Ecosystems, Subsurface drainage, Drainage patterns (Geologic), Marshes, Land reclamation, Natural resources, Condemnation, Federal government.
Identifiers: *Everglades.

S.2465 would establish an Everglades-Big Cypress National Recreation Area of not more than 585,000 acres to be acquired and administered by the Secretary of the Interior. The purpose of the acquisition is to protect for the benefit, education and recreational use of present and future generations the unique environment found in the Big Cypress Swamp area of southwestern Florida. Lands within the recreation area which are owned by the State of Florida or a political subdivision thereof would be acquired only with owner consent; privately-owned, unimproved real property would be vested in the United States effective on the date of enactment, with compensation to be paid upon negotiated settlement or judgment. The hearings also dealt with S.3139. The purpose of this bill is to provide for the acquisition of the Big Cypress area and for appropriate uses thereof through cooperative action by the federal government and the State of Florida. Section 5 of the bill authorizes the appropriation of not more than $156 million for the acquisition of lands and interests in the area. (Tolle-Florida)
W73-05227

ANNUAL REPORTS OF CEQ.

Hearings--Subcomm. on Fisheries and Wildlife Conservation--Comm. on Merchant Marine and Fisheries, United States House of Representatives, 92d Cong, August 6 and September 8, 1971, August 16, 1972. 127 p.

Descriptors: *Water pollution control, *Legislation, *Pollution abatement, *Environmental control, Federal government, Law enforcement, Environmental effects, Legal aspects, Judicial decisions, Regulation, Governmental interrelations, Political aspects, State governments, Economic impact.
Identifiers: Congressional hearings, National Environmental Policy Act, Council on Environmental Quality.

The Subcommittee heard comments on the Second and Third Annual Reports of the Council on Environmental Quality. The chairman of the Council gave the general summary statement. An annual report is a rigorous but an indispensable base for formulating broad range policy advice used in drafting the President's environmental program. The environment is a maturing issue and in response we are beginning to institutionalize our environmental concerns at all governmental levels. The estimated $105 billion expenditure to abate air, water, aad solid waste problems over 5 years is adequate and environmental goals will be best served by a combination of regulation and economic incentives such as the proposed tax on lead. Decisions such as Zabel v. Tabb, Calvert Cliffs and Overton Park which put teeth in the National Environmental Policy Act were discussed in some detail. Interested public and private conservation groups critized the content of the annual reports, specifically pointing out the failure of the Council to adequately report the worst environmental problem, the Nation's energy problem. (Beardsley-Florida)
W73-05228

FEDERAL RESEARCH IN POTABLE-WATER TECHNOLOGY--JOINT DISCUSSION,
F. B. Walling, C. R. Murray, H. G. Hershey, W. P. Simmons, and L. A. Haugseth.
Journal of the American Water Works Association, Vol 64, p 616-633, 1972. 5 fig, 1 tab, 1 chart, 11 ref.

Descriptors: *Potable water, *Administrative agencies, *Research and development, *Water resources development, Allotments, Research facilities, Technology, Federal reclamation law, Arid lands, Hydrologic data, Hydrologic aspects, Data collections, Groundwater, Surface waters, Municipal water, Industrial water, Water supply, Water distribution (Applied), Water quality standards, Desalination, Federal government.

Activities of five Federal agencies are analyzed. The Geological Survey solves basic problems in hydrology, geology, geochemistry and geophysics and develops new techniques and methods for appraising and conserving minerals and water. The water resources division has an hydrologic data network that monitors surface- and groundwater levels and quality in the U.S. The Office of Water Resources Research (OWRR) encourages, provides for and supplements current research and experimental programs in the fields of water supply and of resources affecting water. The OWRR provides annual fund allotments to support state university water-resources research projects. These have resulted in studies on policy, management and the law, studies on economics and cost of water and evaluation of supply and distribution. The Bureau of Reclamation has the job of developing water-related resources in the seventeen western states. The Environmental Protection Agency in addition to setting water quality standards, does research and development in searching for immediate and long-range solutions to many water-supply problems. The Office of Saline Water is trying to develop economical saline water conversion methods for agricultural, industrial and municipal uses. (Nielsen-Florida)
W73-05232

REPORT ON SUBCOMMITTEE ON AIR AND WATER POLLUTION ACTIVITY IN THE 92D CONGRESS,
Senate, Washington, D.C.
For primary bibliographic entry see Field 06E.
W73-05234

PRIVATE REMEDIES FOR POLLUTION OF NAVIGABLE WATERS,
For primary bibliographic entry see Field 06E.
W73-05236

ANALYSIS OF THE DECISION OF THE FLORIDA DISTRICT COURT IN THE CASE OF AMERICAN WATERWAYS OPERATORS, INC., ET AL. V. ASKEW.

Report to the Committee on Public Works, United States Senate, 92d Cong, 2d Sess, August 1972. 59 p, 126 ref.

Descriptors: *Florida, *State jurisdiction, *Oil pollution, *Legislation, *Judicial decisions, Legal review, Federal jurisdiction, Fedeal-state water rights conflicts, Disasters, Water pollution, Constitutional law, Water law, Governmental interrelations, Treaties, Oil spills, Legal aspects.
Identifiers: Water Quality Improvement Act of 1970, abstention, Coastal waters.

The specific objections of the three judge district court to the Florida anti-oil pollution statute are examined and several bases upon which the statute's constitutionality can be upheld are discussed. The evolution of admiralty and maritime law is analyzed, demonstrating that the maritime law of the United States is not today exclusively federal,

nor was it ever intended to be. States, under the federal system, have a role in the formulation of maritime law. If uniformity of law is the goal then the appropriate way to achieve it is by adopting international treaties. The provisions of the Florida statute are discussed in detail and it is shown that they need not conflict with the Water Quality Improvement Act of 1970 or general maritime law. The doctrine of abstention is discussed and it is suggested that this is a prime case for application of the doctrine, particularly in light of the latent ambiguities in the Florida statute itself. (Reed-Florida)
W73-05237

CHICAGO ALLIS MFG. CORP. V. METROPOLITAN SFANITARY DISTRICT OF GREATER CHICAGO (ACTION FOR DECLARATORY JUDGMENT THAT INDUSTRIAL WASTE ORDINANCE VIOLATED STATE AND EDERAL CONSTITUTIONS).
For primary bibliographic entry see Field 03E.
W73-05242

COMMENTS CONCERNING THE COASTAL ZONE OF THE UNITED STATES,
House, Washington, D.C.
For primary bibliographic entry see Field 06E.
W73-05243

NONPOINT RURAL SOURCES OF WATER POLLUTION,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 05B.
W73-05334

NEED FOR CONTROLLING SALINITY OF THE COLORADO RIVER.
Colorado River Board of California, Los Angeles.

Report, August 1970. 89 p, 10 fig, 12 tab, 32 ref, append.

Descriptors: *Salinity, *Irrigation water, *Water quality, Saline water, Irrigation effects, Return flow, Irrigation, Water pollution, Colorado River, California.

Results are presented of an appraisal of sources of salinity of the Colorado River. Probable increases in the river's salinity that will occur in the future, deleterious impact that such increases will have on California's users of Colorado River water, and possible measures for controlling the river's salinity are described. Recommendations are included for actions that, if effected, would tend to keep the river's salinity from increasing above its present high levels. (Skogerboe-Colorado)
W73-05352

CHATTAHOOCHEE CORRIDOR STUDY.
Atlanta Regional Commission, Ga.
For primary bibliographic entry see Field 04C.
W73-05384

A SINGLE DEPARTMENT DEDICATED TO WATER RESOURCES MANAGEMENT,
Detroit Metro Water Dept., Mich.
For primary bibliographic entry see Field 06E.
W73-05385

A STUDY OF THE ANTELOPE VALLEY, THE SANTA CLARITA VALLEY, AND THE SAN GABRIEL MOUNTAINS OF LOS ANGELES COUNTY.
Los Angeles County Regional Planning Commission, Calif.
For primary bibliographic entry see Field 06B.
W73-05386

LOS ANGELES COUNTY PROGRAMS FOR WATER DISTRIBUTION, DRAINAGE CONTROL, SEWERAGE AND WATER RECLAMATION SYSTEMS, REFUSE FACILITIES.
Los Angeles County Regional Planning Commission, Calif.
For primary bibliographic entry see Field 06B.
W73-05387

POSITIVE OPTIONS FOR SAN ANTONIO'S FUTURE WATER QUALITY.
Citizens for a Better Environment, San Antonio, Tex.; American Association of Univ. Women, San Antonio, Tex.; Sierra Club (South Texas Group), San Antonio; and League of Women Voters, San Antonio, Tex.
For primary bibliographic entry see Field 04B.
W73-05389

RESTORATION OF MERCURY CONTAMINATED LAKES AND RIVERS,
Swedish Water and Air Pollution Research Lab., Stockholm.
L. Landner.
IVL Report B 76, August 1970. 11 p, 2 fig, 22 ref.

Descriptors: *Mercury, *Surface waters, *Path of pollutants, *Chemical reactions, Resources development, Sediment-water interfaces, Water, Solubility, Food chains, Sediments, Heavy metals, Metals, Toxicity, Trace elements, Transfer.
Identifiers: *Mercury pollution, *Sweden, *Mercury cycle, Water solubility, Lake restoration, Methyl mercury, Organomercurials.

The Swedish philosophy in restoration of mercury-contaminated lakes and rivers stems from the partly hypothetical model for the mercury cycle in the environment as adopted by Swedish Water Air Pollution Research Laboratory. Methods being investigated to modify the turnover of mercury in a lake include: introduing inorganic materials with a high reactivity in order to fix the mercury in non methylable form, covering the sediments with inorganic material that is essentially free from mercury, removing the sediments by dredging or pumping. Fish in aquaria with fibrous sediment contaminated by phenyl mercury both untreated and covered with 5 mm of sand were tested for methylmercury. The methylmercury in the white muscle of the fish was about 5 times higher in the untreated aquarium than in the one with sand. Ground silicate material applied over sediments contaminated by inorganic mercury had a significant decreasing effect on the methylmercury concentration in fish. Field studies are under way in several areas. (Oleszkiewicz-Vanderbilt)
W73-05400

CHEMICAL ENHANCEMENT OF THE BIODEGRADATION OF CRUDE-OIL POLLUTANTS,
Petrolite Corp., Webster Groves, Mo.
T. J. Robichaux, and H. N. Myrick.
Journal of Petroleum Technology, Vol 24, p 16-20, January 1972. 4 fig, 2 tab, 7 ref.

Descriptors: *Oil pollution, *Oil, *Organic compounds, *Pollution abatement, *Chemical degradation, *Dispersion, *Biodegradation, *Microbial degradation, Degradation (Decomposition), Microorganisms, Feeds, Sludge treatment.

Effects of chemical dispersants on the microbial decomposition of crude oil in aquatic environments were determined. Two important processes for dealing with oil pollutants are presented. First, the rate of biological destruction of hydrocarbons can be increased by emulsifying the oil with a suitable chemical agent. This will permit microbial diffusion to the surface of the oil and provide an aquatic environment for growth. Beyond this, the nature of the chemical dispersant will control the rate of decomposition by the effect it has on the microbial functions. Secondly, the rate of biological destruction can be further increased by seeding the emulsion with microorganisms capable of utilizing hydrocarbon as food source. Such a mixed flora culture as that present in an activated sludge treatment plant provides a suitable array of microorganisms from which the oleophilic microorganisms will develop. (Ensign-PAI)
W73-05414

INTERMEDIATE MIXING OF THERMAL DISCHARGES INTO A UNIFORM CURRENT,
Town School of Civil and Mechanical Engineering, Philadelphia, Pa.
For primary bibliographic entry see Field 05B.
W73-05422

COST EFFECTIVENESS METHODOLOGY FOR ENVIRONMENTAL MONITORING SYSTEMS,
Center for the Environment and Man, Inc., Hartford, Conn.
G. M. Northrop.
In: Northeast Electronics Research and Engineering Meeting, November 2-5, 1971, Boston, Massachusetts, Nerem 71 Record, Part 1, p 23-26. 4 fig, 4 tab, 6 ref.

Descriptors: *Monitoring, *Cost-benefit analysis, *Computer models, *Data processing, Environmental control, Control systems.
Identifiers: *Center for the Environment and Man, *National Data Buoy Project, *Cost-effectiveness methodology.

A computerized cost effectiveness methodology for comparing alternative means for collecting marine environmental data has been developed. Some of the key features of a study conducted on the National Data Buoy environmental monitoring system are presented. Elements of the cost effectiveness approach include: mission, requirements, quantified expert judgment, scenarios, evaluation criteria, system characteristics, tradeoff analysis, sensitivity analysis and documentation. The computerized method has broad application throughout the entire field of cost effectiveness. (Ensign-PAI)
W73-05423

ESTUARINE IN SITU WATER QUALITY MONITORING,
Ocean Data Equipment. Ocean Data Equipment Corp., East Providence, R.I.
G. Fain.
In: Northeast Electronics Research and Engineering Meeting, November 2-5, 1971, Boston, Massachusetts, Nerem 71 Record, Part 1, p 27-30. 1 ref.

Descriptors: *Estuaries, *Indicators, *On-site data collections, *Monitoring, Water quality, Water quality control, Sampling, Hydrogen ion concentration, Turbidity, Biochemical oxygen demand.
Identifiers: *Sensors, *In-situ monitoring systems.

Water quality indicators and methods for measuring them are outlined; also the problems and equipment availability for in situ estuarine monitoring systems are discussed. Some of the indicators described include: biochemical oxygen demand, dissolved oxygen, pH, turbidity and trace materials. Data collected on systems used for continuous in situ water quality monitoring suggest that the major technical limitations of these systems are sensor availability and reliability. Currently used probe type sensors do not measure a wide enough range of parameters, they are comparatively fragile, and have not proven to be stable over long periods. (Ensign-PAI)
W73-05424

NUMERICAL MODEL FOR ESTUARINE WATER QUALITY PREDICTION,
Massachusetts Inst. of Tech., Cambridge.
D. R. F. Harleman, and C. H. Lee.
In: Northeast Electronics Research and Engineering Meeting, November 2-5, 1971, Boston, Massachusetts, Nerem 71 Record, Part 1, p 31-34. 2 fig, 3 ref.

Descriptors: *Estuaries, *Mathematical models, *Analytical techniques, *Water quality, On-site data collections, Water pollutants, Dispersion.
Identifiers: *Mixed estuaries, *Water quality management, *Predictive tools.

Certain techniques of mathematical modeling for water quality control and management in mixed estuaries are outlined. The inter-relationship between mathematical models and the collection of field data necessary for verification are also discussed. A numerical water quality model presented employs a time step which is small in comparison to the tidal period. With this model concentrations can be predicted at any time and at any position along an estuary. It permits the use of either synoptic or intermittent field data, which will allow greater attention to be given in the future to the generation, decay and interaction of multiple water quality indicators under estuarine conditions. (Ensign-PAI)
W73-05425

INTERNATIONAL DREDGE MINING,
International Mining Corp., New York.
P. H. O'Neill.
In: IV, Proceedings of WODCON, World Dredging Conference, Dec 1-3, 1971, New Orleans, Louisiana. WODCON Association, San Pedro, California, p 11-18. 1972. 1 fig, 2 ref.

Descriptors: *Dredging, *Structural design, Engineering, *Legislation, Costs, Depth, Environmental effects.
Identifiers: *Continuous dragline dredging, *Political impediments.

The dredging industry's position on environmental pollution is surveyed. Three aspects are briefly focused upon: environmental problems, the need to dredge to greater depths and political problems. The development of a continuous dragline dredge is described. It is believed that the dredge will answer the demands for efficiently and economically digging to greater depths than are currently possible. The model features power units that drive dual chains attached to which are dragline-type buckets; this technique is flexible enough to adapt to differing conditions, whether onshore or offshore. A general discussion is presented of national and international laws and restrictions which limit the dredging industry's activities both on and offshore. The need for greater cooperation between industry and governing bodies is stressed. (Ensign-PAI)
W73-05439

A VIEW ON CANADIAN DREDGING,
McNamara Marine Ltd., Whitby (Ontario).
A. L. Quinlan.
In: IV, Proceedings of WODCON, World Dredging Conference, Dec 1-3, 1971, New Orleans, Louisiana. WODCON Association, San Pedro, California. p 19-27. 1972.

Descriptors: *Dredging, *Canada, Research and development, *Equipment, Competition, Legislation, Governments.
Identifiers: *Dredging industry overview.

The status of the dredging industry in Canada is summarized. Dredging operations are assessed in terms of equipment, research and development, competition, and automation. The following positions are taken: the waterfront rights of dredging operations are being surrendered to ecologists, management rights are being usurped by unions, entrepenurial rights are being taken over by the government and profits are being swallowed by socialistic politicians. It is suggested that these matters be recognized and rapidly solved, lest the industry grind to a halt. (Ensign-PAI)
W73-05440

OPERATIONAL PLANNING AND ITS ASSOCIATED PROBLEMS FOR DREDGING IN THE PACIFIC NORTHWEST,
Army Engineer District, Portland, Oreg. Dredging Operations Div.
R. J. Hopman.
In: IV Proceedings of WODCON, World Dredging Conference, Dec. 1-3, 1971, New Orleans, Louisana. WODCON Association, San Pedro, California, p 29-47, 1972, 6 ref.

Descriptors: *Dredging, *Disposal, *Systems analysis, Sediments, Environmental effects, Oregon.
Identifiers: *Spoil disposal schemes, Beach nourishment, Wild fowl preserves.

The positive functions which dredging performs for the environment are outlined. The problem of finding deposit sites for dredged sand is discussed; the cut and fill approach to this problem is analyzed, but is seen as only an interim cure to the lack of spoil disposal areas. The following are two alternative methods of dredge disposal: formation of wild fowl nesting and feeding areas and using unpolluted dredged sediment for beach nourishment. Also included is a review of a systems analysis technique which can identify and assess the varied problems, techniques, interpretations and objectives of maintenance dredging. Systems analysis generally consists of the following steps: 1. formulation, 2. search, 3. explanation, 4. interpretation and 5. verification. This technique was used to study coastal projects in Oregon, some of the findings are reported. (Ensign-PAI)
W73-05441

REMOVAL OF RICE CARGO FROM SUNKEN SHIP WITH 28 INCH SUCTION DREDGE,
Panama Canal Co., Balboa Heights Canal Zone.
For primary bibliographic entry see Field 08C.
W73-05442

ENVIRONMENTAL CONSIDERATIONS FOR ESTUARINE DREDGING OPERATIONS,
Oregon State Univ., Corvallis. Graduate Faculty of Ecology.
D. A. Bella, and J. E. McCauley.
In: IV, Proceedings of WODCON, World Dredging Conference, Dec. 1-3, 1971, New Orleans, Louisiana, WODCON Association, San Pedro, California, p 457-482. 1972. 3 fig, 1 tab, 15 ref.

Descriptors: *Estuaries, *Dredging, *Ecosystems, *Model studies, Management, Turbidity, Balance of nature, Environmental effects.
Identifiers: *Benthic system, *Conceptual models.

A conceptual model of estuarine Benthic systems is described. The model includes a look at the organic and inorganic deposits found in estuarine areas, the plant and animal life, including filter and deposit feeders, food webs, suspended particles and transport mechanisms. The range of man's impact on estuarine benthic systems is also surveyed. Particular emphasis is placed upon the role of dredging operations as they affect changes in organic deposition, inorganic deposition, turbidity, tidelands and estuarine hydrodynamics. The limits of current knowledge on the possible adverse effects of such operations as dredging seem to make it advisable to preserve estuarine systems in a relatively undeveloped state. Such preservation would allow continued study of estuarine ecosystems in their natural state and would reduce the probability of widespread irreversible damage. (Ensign-PAI)
W73-05443

TEXAS GULF COAST SEDIMENTS AND WATER QUALITY MANAGEMENT,
Texas A and M Univ., College Station. Dept. of Civil Engineering.
R. W. J. Hann, and J. F. Slowey.
In: IV, Proceedings of WODCON, World Dredging Conference, Dec. 1-3, 1971, New Orleans, Louisiana, WODCON Association, San Pedro, California, p 577-597. 1972. 11 fig, 1 tab.

Descriptors: *Dredging, *Water pollution sources, Soil pollution, Environmental effects, Environmental control, Estuaries.
Identifiers: *Environmental modification, *Primary pollution, *Secondary pollution, *Texas Gulf Coast.

The role which dredging operations play in environmental modification and pollution is briefly sketched. The dredging industry's long-term impact is in the form of environmental modification. New projects, rather than maintenance projects, will bring about the greatest environmental modification. The area of environmental pollution is studied in two phases: primary or self-generated pollution and secondary pollution. Included in the first term are domestic wastes and other discharges from dredges and associated facilities; secondary pollution includes silt suspensions and other problems associated with dredging for shell and minerals, new channel construction and deepening and filling of low areas. The Texas Gulf Coast, an estuarine system which has undergone substantial environmental modification and which in places is subjected to excessive levels of environmental pollution is discussed. (Ensign-PAI)
W73-05444

AN EXPERIMENTAL APPROACH TO THE USE OF DREDGING SPOIL FOR THE CONSTRUCTION OF SALT MARSH ISLANDS,
Marine Science Inst., Bayou La Batre, Ala.
B. A. Vittor.
In: IV, Proceedings of WODCON, World Dredging Conference, Dec. 1-3, 1971, New Orleans, Louisiana. WODCON Association, San Pedro, California, p 599-610, 1972. 1 fig, 5 ref.

Descriptors: *Marshes, *Dredging, *Bays, Aquatic habitats, Marsh management, Wildlife management, Spoil banks.
Identifiers: *Island accretion, *Salt marshes, *Spoilage disposal techniques.

The University of Alabama Marine Science Institute's experimental salt marsh island accretion program is described. The construction of a given area of marsh island involves the destruction of a greater area of bay bottom; however, since bay communities derive much of their sustenance from the marshes, and since marshes are necessary for supporting the early stages of many animals, one acre of marsh is likely to equal several acres of bay in overall value. The marsh accretion project described has a three-fold purpose: first, it provides a means of evaluating the potential for productive salt marsh island development; second, it will offer the world dredging community and regulatory agencies a source of good information on one ecologically sound method of using dredging spoil; and third, it will provide a great deal of basic information on marsh and bay ecosystems. (Ensign-PAI)
W73-05445

DREDGING OPERATIONS AND THE ENVIRONMENT,
Army Engineer District, Galveston, Tex.
N. C. Rhodes.

In: IV, Proceedings of WODCON, World Dredging Conference, Dec. 1-3, 1971, New Orleans, Louisiana. WODCON Association, San Pedro, California, p 719-727. 1972.

Descriptors: *Dredging, *Legislation, *Costs, Equipment, Texas, Environmental control.
Identifiers: Army Corps of Engineers, *Environmental quality criteria.

The effects which the Army Corps of Engineers' dredging operations have had on the environment in the Galveston, Texas area are examined. Special attention is given to the role of new legislation and the creation of new agencies such as the Council for Environmental Quality. The possibility of a future 'no dredging' edict is discussed. Compliance with new regulations has greatly increased the cost of dredging operations. Operations carried out on the Great Lakes involved spoilage removal costs ranging from 35 cents per cubic yard to $6.00 per cubic yard. New concepts must be developed for transporting materials long distances at economical costs. (Ensign-PAI)
W73-05446

WATER POLLUTION CONTROL IN COASTAL AREAS. THE NATURE OF THE PROBLEM,
B. A. Southgate.
In: Symposium on Water Pollution Control in Coastal Areas, May 19-21, 1970, Bournemouth, England, The Institute of Water Pollution Control, London, p 8-12, 1970. 4 ref.

Descriptors: *Sewage disposal, *Coasts, *Seashores, *Sewage treatment, Sewage bacteria, Estuaries, Legislation, Water pollution.
Identifiers: *England, *Sewage discharge.

The history of British legislation for the protection and control of coastal waters and estuaries is briefly traced. The problems surrounding effective treatment of effluent discharges in estuaries are reviewed. Special attention is given to the question of how to best dispose of sewage and industrial wastes which pollute coastal areas commonly used for bathing and water sports. It is noted that even biologically treated sewage yields an effluent which contains large numbers of bacteria, consequently the advantages of this kind of treatment over distant discharge of screened, but otherwise untreated sewage, are not so obvious as they may seem at first. It is suggested that the problem of sewage discharge be more thoroughly investigated so that the least expensive, though still effective, means may be employed. (Ensign-PAI)
W73-05447

THE LAYMAN'S VIEWPOINT,
J. A. Wakefield.
In: Symposium on Water Pollution Control in Coastal Areas, May 19-21, 1970, Bournemouth, England, The Institute of Water Pollution Control, London, p 13-21, 1970.

Descriptors: *Sewage disposal, *Environmental sanitation, *Water management, Leadership, Legislation, Public health, Beaches, Recreation, Water pollution, Water pollution control.
Identifiers: *Coastal Anti-Pollution League (England), *Citizen lobby, *Anti-pollution guidelines.

The role of England's Coastal Anti-Pollution League in representing the average citizen's concern over pollution problems is outlined. The CAPL was formed in 1957, as a local pressure group to persuade a borough council to approve installation of a sewage treatment plant to alleviate pollution of local beaches. The League has limited its activities to dealing with problems of sewage pollution only; they have studied the various ways in which the polluting material reaches the sea, and have agitated for control legislation. The CAPL concludes that there is still a considerable amount of visible pollution on the coasts of England and Wales, and that unless greater control is exercised over coastal authorities, the required improvements will not be achieved. (Ensign-PAI)
W73-05448

PUBLIC HEALTH ASPECTS,
Public Health Lab., Exeter (England).
B. Moore.
In: Symposium on Water Pollution Control in Coastal Areas, May 19-21, 1970, Bournemouth, England, The Institute of Water Pollution Control, London. p 22-33, 1970. 4 fig, 12 ref.

Descriptors: *Public health, *Sewage disposal, *Coasts, *Beaches, *Swimming, Sea water, Bacteria, Water pollution, Water pollution effects, Water pollution control.
Identifiers: *Public health recommendations.

A retrospective look at the 1953 Public Health Laboratory Service committee report is presented. The committee's conclusions and recommendations concerning health and bathing in polluted waters are evaluated with respect to time and, in some cases, modified in the light of later findings. Appropriate procedures for demonstrating the existence of an environmental health hazard are discussed in detail. Various aspects of methodology used in the study of microbial hazards in sea water are delineated. Apart from the public health problems of contaminated shellfish, coastal water pollution control is basically a matter of amenity rather than health. The PHLS conclusion that the health risks of bathing in sewage-contaminated sea water are negligible is upheld. (Ensign-PAI)
W73-05449

DEALING WITH MAJOR OIL SPILLS AT SEA,
British Petroleum Co. Ltd., London (England).
L. R. Beynon.
In: Water Pollution by Oil Seminar, May 4-8, 1970, Aviemore, Inverness-shire, Scotland, The Institute of Petroleum, London. p 187-193, 1971.

Descriptors: *Oil spills, *Fuels, *Water pollution control, Burning, Dispersion, Pollution abatement, Oil pollution.
Identifiers: *Oil booms, *Oil containment, *Salvage techniques, *Cargo tankers.

Methods for effective treatment of oil spills in the sea are presented. Specifically the problem of spills resulting from cargo tanker accidents at sea is discussed. Three steps are listed as the basis for thorough anti-pollution action: (1) to limit the amount of the oil spill; (2) to contain the spilt oil; and (3) to clean up the oil. The first step can be accomplished by salvaging the discharged cargo, or, as a last resort with crude oil, burning it. Containing an oil spill is regarded as particularly important, since wind and currents can quickly spread the spillage and increase clearance problems enormously. The usefulness of booms in the area of containment is discussed. The third step, the clean-up stage is divided into analyses of retrieval, burning, sinking and dispersing techniques. (Ensign-PAI)
W73-05458

BALLAST AND WASH WATERS FROM TANKERS,
Shell International Marine Ltd., London (England).
M. P. Holdsworth.
In: Water Pollution by Oil Seminar, May 4-8, 1970, Aviemore, Inverness-shire, Scotland, The Institute of Petroleum, London, p 195-204. 1971. 2 fig, 2 tab.

Descriptors: *Oil industry, *Transportation, *Oil wastes, Water pollution control.
Identifiers: *Tankers, *Load-on-Top technique, *Ballast, Refineries.

Some of the actions which the oil and international tanker industries have undertaken to conserve the marine environment are outlined and discussed. Industrial developments, such as the 'Load-on-Top' procedure, are described, with reference to the provisions of the International Convention for the Prevention of Pollution of the Sea by Oil (1954). The 'Load-on-Top' method consolidates the washing residues, de-waters them, and then the subsequent cargo is loaded 'on top'. Lastly, the cargo and residues are delivered to a refinery, which takes over the task of removing the remaining associated salt water. At the present time 75% of the world's crude oil transporters adhere to this procedure; smaller, independent refiners have been reluctant to accept 'Load-on-Top' cargoes. The new ammendments to the 1954 Oil Pollution Convention are expected to provide the needed impetus to force complete compliance with the 'Load-on-Top' technique. (Ensign-PAI)
W73-05459

METHODS OF DEALING WITH OIL POLLUTION ON AND CLOSE TO THE SHORE,
Warren Spring Lab., Stevenage (England).
J. W. Smith.
In: Water Pollution by Oil Seminar, May 4-8, 1970, Aviemore, Inverness-shire, Scotland, The Institute of Petroleum, London, p 205-223. 1971. 3 fig, 4 ref.

Descriptors: *Oil spills, *Oil wastes, *Beaches, Shores, Chemicals, Water pollution treatment, Emsulfiers, Absorption, Oil pollution.
Identifiers: *Oil pollution control techniques, *Great Britain.

The problem of shoreline oil pollution in the United Kingdom and alternative methods of dealing with it, are examined. Methods of removing oil floating on the sea, including: Skimming, absorbing, gelling, sinking and emulsifying it are discussed in terms of their usefulness and applicability to particular circumstances. Procedures used to remove oil once it has landed on the shore are detailed, with attention to the type of oil and the nature of the polluted surface. The five techniques analysed are: destroying the oil by burning; absorbing the oil with some material that can be removed; rendering the oil inoffensive to beach users by cloaking or sealing it; removal of the oil either as oil or mixed with the contaminated beach material; and dispersing the oil by chemical or solvent treatment and washing it into the sea. The accusation that chemical cleansers are harmful to the environment is almost completely without foundation. (Ensign-PAI)
W73-05460

THE USE OF BOOMS AS BARRIERS TO OIL POLLUTION IN TIDAL ESTUARIES AND SHELTERED WATERS,
Hydraulics Research Station, Wallingford (England).
D. E. Newman, and N. I. MacBeth.
In: Water Pollution by Oil Seminar, May 4-8, 1970, Aviemore, Inverness-shire, Scotland, The Institute of Petroleum, London, p 225-235, 1971. 6 fig, 1 tab.

Descriptors: *Oil spills, *Water pollution treatment, *Estuaries, Model studies, Design criteria, Currents, Tides, Costs, *Oil pollution.
Identifiers: *Oil booms, *Gannel estuary (England), Moorings.

Model tests were conducted in the Gannel, near Newquay to investigate the behavior of oil booms in waves and tidal currents; also the general usefulness of various kinds of booms in preventing water pollution by oil was assessed. The results indicated that in tidal estuaries with current velocities up to 4 ft/sec, booms were a practical means of preventing the spread of oil. The optimal boom design was a smooth and uncluttered profile. The

boom should be held oblique to the water flow in a smooth curve, making a mean angle to the flow of approximately 25 deg for the higher currents of 2-4 ft/sec and up to 40 deg to the flow for lower velocities. A layout design for the most efficient and least expensive method of mooring a boom is presented. (Ensign-PAI)
W73-05461

THE EFFECT OF SOME CHEMICAL AND BIOLOGICAL FACTORS ON THE DEGRADATION OF CRUDE OIL AT SEA,
Naval Ordnance Inspection Lab., Caerwent (England).
C. A. Parker, M. Freegarde, and C. G. Hatchard.
In: Water Pollution by Oil Seminar, May 4-8, 1970, Aviemore, Inverness-shire, Scotland, The Institute of Petroleum, London, p 237-244, 1971. 2 fig, 3 tab, 12 ref.

Descriptors: *Oil wastes, *Solubility, *Dispersion, *Zooplankton, *Oxidation, Water pollution, Water pollution control, Oil pollution.
Identifiers: *Photochemical oxidation.

Three possible methods of degrading crude oil at sea are detailed: solubility and dispersion, consumption by zooplankton, and photochemical oxidation. The data presented on solubility and dispersion indicate that the loss of the most objectionable crude oil fractions by true solution must be dismissed, but the formation of fine dispersions merits careful consideration. Experiments performed on copepods showed that the extent to which they can contribute to the immobilization of an oil slick will depend on the amount of oil dispersed as fine droplets, the rate at which the copepods sweep the water clear and the number of copepods present. Plankton uptake is likely to be most significant in the case of oil slicks artificially dispersed by detergent treatment. The research conducted on the usefulness of photochemical oxidation suggests that photochemical degradation of a thin slick or dispersed oil near the surface will be slow, but probably appreciable on long exposure. (Ensign-PAI)
W73-05462

THE FIGHT AGAINST POLLUTION BY OIL ON THE COASTS OF BRITTANY,
L. Cabioch.
In: Water Pollution by Oil Seminar, May 4-8, 1970, Aviemore, Inverness-shire, Scotland, The Institute of Petroleum, London, p 245-256, 1971. 6 ref.

Descriptors: *Oil spills, *Beaches, *Chemicals, Marine fauna, Marine flora, Water pollution control, Water pollution effects, Oil pollution.
Identifiers: *Brittany Coast, *TORREY CANYON, *Chemical dispersants, Clean-up techniques.

The techniques which were employed in Britain to combat the extensive oil pollution caused by the shipwreck of the TORREY CANYON in March of 1967 are delineated and evaluated. Background information on the geographic, oceanographic, and economic features of the north coast of Brittany is included. Considerable improvision of anti-pollution techniques was necessitated by the varied nature of the pollution of the Brittany coastline. Cleansing techniques such as pumping floating oil from beach waters and shoveling up beached oil was only partially useful, since much of the coastline is inaccessible. Chemical dispersants were used to decontaminate the most important tourist areas. The expected results occurred: massive destruction of a major part of the littoral flora and fauna, as well as shallow water life. The action of the sea will eventually result in the progressive disappearance of the major effects of the pollution. (Ensign-PAI)
W73-05463

SOME ASPECTS OF THE HAMILTON TRADER OIL SPILL,
A. J. O'Sullivan.
In: Water Pollution by Oil Seminar, May 4-8, 1970, Aviemore, Inverness-shire, Scotland, The Institute of Petroleum, London, p 307-316, 1971. 4 fig, 3 ref.

Descriptors: *Oil spills, *Dispersion, *Detergents, Tracking techniques, Sampling, Water pollution, Coasts, Water pollution effects, Water pollution control.
Identifiers: *HAMILTON TRADER, *Aerial reconnaissance, *Early warning system.

The 1969 HAMILTON TRADER oil spill is described and the effectiveness of the British government's control arrangements in dealing with the incident is evaluated. Two days after the spill Corexit 7664, an oil dispersant, was sprayed on the slick; no detergents were used on the Cumberland coast, instead mechanical methods were used to remove all oil which came ashore. Despite new government directives, the ability to cope with oil pollution has improved little since the Torrey Canyon disaster, two years prior. Suggestions for an improved program to combat pollution include: a system of early warning and communications, aerial reconnaissance and tracking, provisions for immediate liaison between local authorities and other organizations, and sampling and identification of beach pollutants. (Ensign-PAI)
W73-05467

SEPARATION OF OIL DISPERSIONS FROM WATER BY FIBROUS BED COALESCENCE,
Illinois Inst. of Tech., Chicago. Dept. of Chemical Engineering.
W. M. Langdon, P. P. Naik, and D. T. Wasan.
Environmental Science and Technology, Vol 6, No 10, p 905-910, October 1972. 6 fig, 3 tab, 17 ref.

Descriptors: *Oil, *Separation techniques, *Effluent streams, *Coalescence, Reflectance, Industrial wastes, Equipment, Pollution abatement.
Identifiers: *Kerosene, Transmittance, Glass fibers.

A 1 sq ft coalescer unit using commercially available phenol for formaldehyde-coated glass fibers of 3.2 micron diam has been designed for removing a trace quantity of dispersed oil from water. It was tested on both a synthetic stream and on an actual industrial effluent stream. The influent stream contained 85-100 ppm by volume of oil, and the effluent contained an average of 1 ppm by volume of oil. Thus oil removal efficiency of essentially 100 percent was obtained at a superficial velocity of 1 ft/min. The influent and effluent oil concentrations were measured by both light transmission and light reflectance apparatus. The pressure drop increased from 2 to 25 psi over run times which varied from 14 to 305 hr, owing mainly to accumulation of oil in the bed. Consequently, the removal efficiencies were obtained under unsteady-state conditions. The present design is suitable for large-scale operation by the use of both multiple cells and larger individual cells. (Little-Battelle)
W73-05568

DUMPING OF WASTE MATERIAL.
For primary bibliographic entry see Field 06E.
W73-05591

PROTECTION AND IMPROVEMENT OF WATERS; ENFORCEMENT.
For primary bibliographic entry see Field 06E.
W73-05598

OIL DISCHARGE PREVENTION AND POLLUTION CONTROL.
For primary bibliographic entry see Field 06E.
W73-05599

INTERSTATE WATER POLLUTION CONTROL.
For primary bibliographic entry see Field 06E.
W73-05600

MAINE'S COASTAL CONVEYANCE OF OIL ACT: JURISDICTIONAL CONSIDERATIONS.

Maine Law Review, Vol 24, p 299-315, 1972. 112 ref.

Descriptors: *Oil pollution, *Governmental interrelations, *Maine, *Legislation, Federal government, Federal jurisdiction, Pollution abatement, Water pollution control, Environmental effects, Coasts, Atlantic Ocean, Judicial decisions, Legal aspects, Transportation, Oil spills, Federal-state water rights conflicts, Constitutional law, Water quality.

Maine's Coastal Conveyance of Oil Act is the most comprehensive oil discharge control law in the United States. Such broad regulatory legislation inevitably raises questions of constitutionality and, as expected, the oil industry has brought a challenge to the Maine statute. In American Oil Co. et al v. Environmental Improvement Commission, a declaratory judgment action, it has been alleged that the Maine act violates the commerce, due process, equal protection and admiralty clauses of the United States Constitution. Although the Act consitutes substantive admiralty law, it supplements pre-existing federal rules of liability without seriously harming the federal interest in uniformity, thus, as an exercise of police power, the Maine legislation is constitutionally sound under the modern interest balancing theory of federal-state admiralty relations. Further, the Maine Act complements the Federal Water Quality Improvement Act in response to Congressional design. This federal legislation does not and was not intended to preempt state action such as that enacted by the State of Maine. Because of the ill-defined nature of admiralty jurisdiction, congressional regulation of state competence to supplement maritime law should be accorded great weight in defining federal-state relations in admiralty jurisdiction. (Tolle-Florida)
W73-05604

THE LITIGATION FUNCTION IN THE BASF CONTROVERSY,
Clemson Univ., S.C.
H. E. Albert.
1971, 8 P. OWRR-B-034-SC (1).

Descriptors: *Political aspects, *South Carolina, *Legal aspects, *Governmental interrelations, Legal review, Project planning, Negotiations, Local governments, Governments, Judicial decisions, Administration, Federal government, State governments, Political constraints, Pollution abatement.

The decisive events in stopping the BASF petrochemical plant from locating in Port Victoria, South Carolina occurred in Washington. Various groups opposed BASF, and each had different ideas on how to combat BASF within the polity of South Carolina. The prevailing group were those who expressed a total lack of faith in the responsiveness of South Carolina public officials. The strategy of the anti-BASF forces was to present their case to Washington officials while diverting the attention of pro-BASF forces by litigating the issue in the South Carolina courts. The anti-BASF forces were able to present a one-sided argument in Washington, with no rebuttal from state leaders, in spite of the fact that federal officials attempted to warn them of the serious intentions of the anti-BASF forces. Litigation served the dual function of harassing state officials and diverting their attention from the main attack in Washington. (Glickman-Florida)
W73-05605

STATUS OF COASTAL ZONE LEGISLATION,
South Carolina Univ., Columbia.
For primary bibliographic entry see Field 06E.
W73-05606

OIL POLLUTION LIABILITY AND FINANCIAL RESPONSIBILITY.
Department of Transportation, Washington, D.C.
For primary bibliographic entry see Field 06E.
W73-05607

CONSENTING TO THE KANSAS-NEBRASKA BIG BLUE RIVER COMPACT.
For primary bibliographic entry see Field 06E.
W73-05612

FISH DISEASE CONTROL ACT OF 1972.

Senate Comm. on Commerce, Senate Report No. 92-1250, 92d Cong, 2d Sess, October 2, 1972. 18 p.

Descriptors: *Fish diseases, *Fish conservation, *Legislation, *Governmental interrelations, Transportation, Federal government, Regulation, State government, Cost repayment, Compensation, Fish, Commercial fish, Penalties (Legal), Law enforcement.
Identifiers: *Fish Disease Control Act.

The Secretary of Commerce or of the Interior will list species of fish that pose a threat to the fishery resources of the United States as sources for the spread of fish disease. Once listed, the Secretary is authorized to regulate the interstate and foreign commerce of such fish. He can order the owner or carrier of listed fish to be moved in interstate or foreign commerce to destroy, disinfect or quarantine the fish or their containers. Owners and carriers will be compensated for expenses of such procedures. One who knowingly transports listed fish or those with listed diseases in interstate or foreign commerce is punishable by up to $1000 fine and/or 1 year imprisonment. The Secretary is authorized to enter into cooperative agreements with the states to establish a coordinated national disease control program by means of financial and other assistance, and to subsequently inspect state procedures to insure that they meet requirement guidelines. The Secretary may also enter into agreements with interstate fishery commissions and fish farming organizations. (Glickman-Florida)
W73-05613

CONFERENCE IN THE MATTER OF POLLUTION OF THE NAVIGABLE WATERS OF BISCAYNE BAY AND ITS TRIBUTARIES IN THE STATE OF FLORIDA.
Federal Water Pollution Control Administration, Washington, D.C.
For primary bibliographic entry see Field 05C.
W73-05615

A SIMPLIFIED METHOD TO RELATE AVERAGE HEAD TO TOTAL FLOW,
Oakland County Dept. of Public Works, Pontiac, Mich.
For primary bibliographic entry see Field 07B.
W73-05620

ON THE CONSTRUCTION OF LARGE SCREENS,
Ruhrverband, Essen (West Germany).
G. W. Annen.
Water Research, Vol 6, p 391, 1972.

Descriptors: *Screens, *Transportation, Waste treatment, Waste disposal, Capital costs, Economics, Ventilation, Explosions.
Identifiers: *Screenings, Ruhrverband.

Because of problems with ventilation, installation and explosion protection, all of which involve substantial construction costs, the Ruhrverband prefers freestanding screens, if climatic and aesthetic conditions permit. With free-standing screens, screenings are more accessible to transport media and therefore, are more economical to handle. (Smith-Texas)
W73-05624

POLLUTION CONTROL REGULATIONS-A PROBLEM OF FILLING GAPS,
Environmental Protection Agency, Kansas City, Mo. Region VII.
J. M. Rademacher.
Water Research, Vol 6, p 365-367, 1972. 1 fig.

Descriptors: *Water quality control, *Water pollution control, *Water pollution treatment, Federal government, Waste water treatment, Treatment facilities, Design criteria, Operation and maintenance.
Identifiers: *Environmental Protection Agency, Design gaps, Operation and maintenance gaps.

Water quality control is threatened by unenlightened design, and poor operation and maintenance that is condoned and abetted by decision makers. In order to achieve really clean water, in addition to research and construction, a concurrent program to close the design and the 'decision' gaps is needed. (Smith-Texas)
W73-05626

DAN REGION SEWAGE RECLAMATION PROJECT,
Mekorot Water Co., Tel-Aviv (Israel).
For primary bibliographic entry see Field 05D.
W73-05627

PROGRAM DESIGN-1971, SAN FRANCISCO BAY REGION ENVIRONMENT AND RESOURCES PLANNING STUDY.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 06B.
W73-05691

RETURNED PROFITS.
For primary bibliographic entry see Field 03F.
W73-05724

GET DOUBLE USE OUT OF IRRIGATION WATER,
Agricultural Research Service, Kimberly, Idaho. Snake River Research Center.
For primary bibliographic entry see Field 03F.
W73-05729

SALT RIVER PROJECT'S COMPUTERIZED IRRIGATION.
For primary bibliographic entry see Field 03F.
W73-05733

THE SOIL AS A RESOURCE RENOVATOR,
Department of Agriculture, Washington, D.C.
For primary bibliographic entry see Field 05D.
W73-05736

A SYMPOSIUM AS CATALYST IN A PUBLIC--PRIVATE SECTOR CONFLICT,
For primary bibliographic entry see Field 06E.
W73-05743

'A THEORETICAL NOTE ON THE CAPACITY OF THE MARKET SYSTEM TO ABATE POLLUTION': REJOINDER,
Texas A and M Univ., College Station. Dept. of Economics.
W. P. Gramm.
Land Economics, Vol 48, No 3, p 306-308, August 1972.

Descriptors: *Pollution abatement, *Demand, Prices, Profit, Water pollution control.
Identifiers: *Consumer sovereignty, Markets, Response.

If pollution consciousness affects the consumer's decision to purchase goods, its impact must show up in his utility function or in his budget constraint. A model is posited which assumes that an individual's utility depends on the different service flows yielded by any good. These service flows are consumption services, pollution abatement services, and esteem services. If an individual values pollution abatement he will always purchase one good over another if the first yields the same consumption services and sells at the same price as the second good, so long as production of the first good creates the least pollution. If the individual does not value pollution abatement but is concerned about the esteem with which he is held by others, he will choose the relatively pollution-free good, if some members of society value pollution abatement and lose esteem for those who do not at least show outward signs of similar concern. Given consumer valuation of pollution abatement, there are returns to developing pollution abatement production processes and pollution-free goods. Thus, we can expect some response from the market system toward abating pollution. (Settle-Wisconsin)
W73-05744

THE ECONOMIC IMPACT OF POLLUTION CONTROL, A SUMMARY OF RECENT STUDIES.

For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402, Price $2.50. Prepared for the Council on Environmental Quality, Dept of Commerce, and Environmental Protection Agency, March 1972. 332 p, 7 fig, 40 tab.

Descriptors: *Water pollution control, *Pollution abatement, *Standards, *Economic impact, Industries, Costs, Prices, Employment.
Identifiers: Macroeconomic effects, Microeconomic effects.

Twelve studies designed to assess the economic impacts of air and water pollution abatement requirements on a number of industrial activities are summarized. Eleven of the studies are microeconomic in nature. The industries they focus on are automobiles, baking, cement, electric power generators, fruit and vegetable canning and freezing, iron foundries, leather tanning, nonferrous metals smelting and refining, petroleum refineries, pulp and paper mills, and steel making. These studies concentrated on such variables as sales, prices, profits, plant closings, employment, and community impacts for the 1972-1976 period. Analysis suggested that none of these industries would have their long-run viability seriously threatened by the anticipated pollution abatement requirements. The twelfth study is a macroeconomic analysis using a computer-based econometric model to determine the impact of pollution abatement costs on such macroeconomic variables as growth of gross national product, inflation, unemployment, interest rates, and balances of trade and payments for the period 1972-1980. The model suggests that the national economy will not be severely impacted by the imposition of pollution abatement standards, although the impact will not be insignificant. (Settle-Wisconsin)
W73-05756

THE ROLE OF WATER AND SEWER EXTENSION FINANCING IN GUIDING URBAN RESIDENTIAL GROWTH,
Tennessee Univ., Knoxville.
For primary bibliographic entry see Field 03D.

W73-05759

THE CEMENT INDUSTRY: ECONOMIC IMPACT OF POLLUTION CONTROL COSTS, VOLUMES I AND II.
Boston Consulting Group, Inc., Mass.

Available from the National Technical Information Service, Vol I as PB-207 150, $3.00 in paper copy, $0.95 inmicrofiche, Vol II as PB-207 151, $6.00 in paper copy, $0.95 in microfiche. The Council on Environmental Quality and The Environmental Protection Agency, November 1971. 192 p, 57 exhibits, 5 append. EQC-204.

Descriptors: *Cements, *Industries, *Industrial wastes, Water pollution, Air pollution, Pollution abatement.
Identifiers: Economic impact, Costs, Employment.

The main pollutants from cement plants are dust and water-borne alkalies which are leached from the dust. In the 1961-1971 period, the cement industry spent approximately $216 million on capital equipment, or about 44 cents per barrel of installed capacity to reduce the emission of these pollutants. The Environmental Protection Agency estimates that the cement industry will have to make capital expenditures of an additional $96.6 million for air pollution control, and $25.3 million for water pollution control to further upgrade facilities built prior to 1967. Based on these and other Agency estimates, the incremental investment and operating costs are expected to have major impacts on several aspects of the industry. Cement prices will average about two percent higher. However, this price increase should have little effect on the total future U.S. consumption of cement. In addition, the impact of pollution abatement expenditures on employment will be minimal and not concentrated geographically. Closings of already marginal plants will accelerate substantially. Approximately 25 cement plant closings can be expected during the 1970-1975 period. The combined effects of plant size advantage, required pollution control expenditures, and labor cost pressure should increase the rate of plant construction. (Settle-Wisconsin)
W73-05761

THE LEATHER INDUSTRY: A STUDY OF THE IMPACT OF POLLUTION CONTROL COSTS, (VOLUMES I, II, AND III).
Urban Systems Research and Engineering, Inc., Cambridge, Mass.

Available from the National Technical Information Service Vol 1 as PB-207 152, $3.00 in paper copy, Vol 2 as PB-207 153, $6.00 in paper copy, and Vol 3 as PB-207 154, $3.00 in paper copy, $0.95 in microfiche each. Contract report for The Council on Environmental Quality, December, 1971. 184 p, 3 fig, 30 tab, 1 append. EQC-211.

Descriptors: *Water pollution, *Pollution abatement, *Standards, Economic impact, Costs, Prices, Employment, Profit.
Identifiers: *Leather industry.

Leather tanneries have traditionally been regarded as major polluters. The basic process is chemical treatment of hides, which produces substantial liquid effluent. Some air pollution is also created. However, analysis of the leather industry suggests that the impact of pollution control costs on the industry will be minimal. The cost of controlling the industry's water pollution and providing secondary treatment will represent as additional cost of production equal to one percent or less of annual sales for most firms. The leather industry faces a relatively inelastic demand for its product, so it should have no difficulty passing on this cost increase in the form of higher prices. Some marginal firms have been closing and will continue to close. However, this phenomena results from a contracting market for leather, not from the inability of firms to adjust to pollution control costs. In fact, only very unusual circumstances would a tannery have to close because of pollution control costs. Tanneries always have the option of subcontracting the preliminary tanning operations and thus eliminating 90 percent of the BOD waste. (Settle-Wisconsin)
W73-05762

EFFECT OF DIFFERENT NITROGENOUS FERTILIZERS IN RAINFED, RAGI,
University of Agricultural Sciences, Bangalore (India). Agronomy Div.
For primary bibliographic entry see Field 03F.
W73-05767

WATER USE BY SUGAR BEETS IN A SEMIARID ENVIRONMENT AS INFLUENCED BY POPULATION AND NITROGEN FERTILIZER,
North Dakota State Univ., Fargo. Dept. of Soils.
For primary bibliographic entry see Field 03F.
W73-05773

REVOLUTIONARY DRIP IRRIGATION SYSTEM TO BE INTRODUCED IN UNITED STATES BY AGREEMENT WITH ISRAELI DEVELOPERS.
For primary bibliographic entry see Field 03F.
W73-05776

AGRICULTURAL RUNOFF--CHARACTERISTICS AND CONTROL,
Cornell Univ., Ithaca, N.Y. Dept. of Civil and Agricultural Engineering.
For primary bibliographic entry see Field 05B.
W73-05794

COMPUTER-BASED OPTIMAL DESIGN OF SEWER SYSTEMS,
Brigham Young Univ., Provo, Utah. Dept. of Civil Engineering.
For primary bibliographic entry see Field 08A.
W73-05809

THE COMPUTER AS AN AID TO ENVIRONMENTAL PLANNING,
University Coll. of Swansea (Wales). Dept. of Civil Engineering.
For primary bibliographic entry see Field 07C.
W73-05815

PROBLEMS IN LEAD MINING WASTE CONTROL,
Missouri Univ., Rolla.
J. C. Jennett, and B. G. Wixson.
Journal Water Pollution Control Federation, Vol. 44, No. 11, p2103-2110, November, 1972. 2 fig, 4 tab, 14 ref.

Descriptors: Mining, *Mine wastes, *Missouri, Mining engineering, Dewatering, Downstream, *Pollutant identification, Sediment control, Desilting, *Diatoms, *Algae, Heavy metals, Lead, Zinc, Copper.
Identifiers: Flotation, Ore processing.

An analysis of mining wastewater and treatment operations in the New Lead Belt of Southeastern Missouri is presented. An overview of mining operations is given in order to demonstrate the role played by the specific waste materials involved. Biological examination of water samples indicated that three diatom genera Synedra, Navicula, and Cymbella were useful as biological indicators. Synedra and Navicula were tolerant of mining effluent and Cymbella intolerant. Recommendations for control and treatment of lead mining wastes were made and are presently being implemented by several mining companies. (Smith-NWWA)
W73-05822

REGULATORY ASPECTS OF LIQUID WASTE INJECTION INTO SALINE AQUIFERS,
Missouri Univ., Rolla.
D. L. Warner.
Water Resources Research, Vol. 6, No. 5, p 1458-1463, October, 1970. 1 tab, 5 ref.

Descriptors: Waste disposal, *Waste disposal wells, Liquid wastes, Industrial wastes, Industrial water, *Injection wells, *Regulation, Permits, State governments, State jurisdiction, Standards, Specifications, *Well regulations.
Identifiers: Licensing, Abandonment (Wells).

Industrial waste water injection wells have been constructed. Review of regulatory procedures followed in various states has led to the conclusion that essential steps in the development, operation, and regulation of waste water injection systems are: (1) Preliminary assessment by the applicant of the geology and geohydrology at the proposed site and of the suitability of the waste water for subsurface injection, in consultation with the appropriate regulatory authorities. (2) Formal request by the applicant for permission to drill and test a well or convert and test an existing well for underground waste water injection. (3) Construction or conversion and testing of the well, and submission of subsurface information to the regulatory authorities. (4) Formal request by the applicant for permission to use the completed well for waste water injection. (5) Operation of the system under supervision of the regulatory authorities. (6) Abandonment of the well by the operator with the approval and supervision of the regulatory authorities. (Smith-NWWA)
W73-05828

06. WATER RESOURCES PLANNING

POSITIVE OPTIONS FOR SAN ANTONIO'S FUTURE WATER QUALITY.
Citizens for a Better Environment, San Antonio, Tex.; American Association of Univ. Women, San Antonio, Tex.; Sierra Club (South Texas Group), San Antonio; and League of Women Voters, San Antonio, Tex.
For primary bibliographic entry see Field 04B.
W73-05389

6A. Techniques of Planning

OPTIMUM OPERATIONS MODEL FOR SHASTA-TRINITY SYSTEM,
Bureau of Reclamation, Sacramento, Calif. Mid-Pacific Regional Office.
D. M. Fults, and L. F. Hancock.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 98, No HY9, p 1497-1514, Sept 1972. 5 fig, 1 tab, 3 ref, 2 append.

Descriptors: Dynamic programming, Operations research, Computer models, Computer applications, Scheduling, *Mathematical models, River systems, Simulation, *Reservoir operation, Power system operations, California, Electric power production, Project planning, Optimum use, Flood control, Systems analysis, Synthetic hydrology, *Systems engineering.
Identifiers: Central Valley Project.

A mathematical model was developed to optimize water and power operations on a daily basis over a 30-day period for the northern portion of the Central Valley Project. The study was undertaken to demonstrate the application of the state dynamic programming theory in a real world environment; the report does not describe the theory. The constraints of each reservoir are expressed algebraically, and the model considers power generation,

firm water contracts, mandatory releases, and flood control. The model included Clair Engle, Lewiston, Whiskeytown, Shasta, and Keswick Reservoirs, and is defined in terms of state variable, stage, state transformation, and the recursive equation. Algorithms, equations, and program flow diagrams are given, including a computer program description. The model was applied to project forecasted operations for May 4 through June 2, 1971, and tables generated for storage and energy policies. Net discernible benefits from using model results were an increase in power generation of over 21,000 Mwhrs, and confirmation of the technique. (USBR)
W73-05347

OPERATIONAL PLANNING AND ITS ASSOCIATED PROBLEMS FOR DREDGING IN THE PACIFIC NORTHWEST,
Army Engineer District, Portland, Oreg. Dredging Operations Div.
For primary bibliographic entry see Field 05G.
W73-05441

DEVELOPMENT OF A STATE WATER--PLANNING MODEL, PART III: PERIPHERAL MODELS OF SUB-BASIN 43-Q OF THE YELLOWSTONE BASIN,
Montana State Univ., Bozeman. Water Resources Research Center.
D. W. Boyd, and T. T. Williams.
Report No 32, 1973. 108 p, 5 tab, 5 fig, 5 ref, 10 append. OWRR B-029-MONT (4).

Descriptors: *Planning, *Systems analysis, *Computer models, *Model studies, Montana.
Identifiers: *Montana water plan, *Yellowstone River basin.

This report is the third of five reports that will be published concerning the, 'Development of a State Water-Planning Model.' Part I, 'Methodology' constituted the first phase. A correlation model, a balance model and a peripheral model were developed. The methodology was extended in Part II, 'Peripheral Models of the Yellowstone Basin'. This report, Part III, details the expansion and application of the methodology to a sub-basin of the Yellowstone in terms of annual and monthly models. Parts IV and V will deal with data preparation and the data bank. The philosophy underlying the development of a state water-planning model embodied the use of systems analysis. A first analysis resulted in a state 'peripheral' or 'macro' model using as few parameters as possible. An extension of that analysis to the Yellowstone Basin resulted in a basin peripheral model. A Yellowstone River reach with its associated drainage was selected for the final analysis. The systems analysis and development reported formulate a pattern for constructing peripheral models of any sub-basin within the State. (See also W71-10641 and W72-10435) (Holje-Montana)
W73-05578

SYSTEMS ENGINEERING APPLIED TO A NEW LOS ANGELES PLANT,
Los Angeles City Engineers Dept., Calif.
For primary bibliographic entry see Field 05D.
W73-05636

SIMULATION OF EXPECTED CROP RETURNS,
North Carolina State Univ., Raleigh. Dept. of Biological and Agricultural Engineering.
For primary bibliographic entry see Field 03F.
W73-05726

SYSTEMS DYNAMICS AS A TOOL FOR RESOURCE MANAGEMENT: ATLANTIC MENHADEN FISHERY CASE STUDY,
Massachusetts Inst. of Tech., Cambridge. Charles Stark Draper Lab.
For primary bibliographic entry see Field 06B.
W73-05746

FLOOD RISK AND AGRICULTURAL LAND VALUES: A TEST,
National Bureau of Economic Research, New York.
For primary bibliographic entry see Field 03F.
W73-05748

COMPUTER-BASED OPTIMAL DESIGN OF SEWER SYSTEMS,
Brigham Young Univ., Provo, Utah. Dept. of Civil Engineering.
For primary bibliographic entry see Field 08A.
W73-05809

COMPUTERIZING PIPELINE DESIGN,
Pitometer Associates, Inc., Chicago, Ill.
For primary bibliographic entry see Field 08A.
W73-05810

EVALUATION OF HARBOR DEEPENING PROJECTS,
Calcutta Port Commissioners (India).
For primary bibliographic entry see Field 06B.
W73-05811

CHEBYSHEV-LIKE INEQUALITIES FOR DAM MODELS,
Cornell Univ., Ithaca, N.Y. Dept. of Operations Research.
B. W. Turnbull.
Journal of Applied Probability, Vol. 9, No 3, p 617-629, October, 1972. 2 fig, 12 ref.

Descriptors: *Dams, *Mathematical models, *Systems analysis, Inflow, Outflow, Water level.
Identifiers: *Theory of gambling, *Chebyshev inequality, *Non-Markovian inputs, Capacity, Release rule.

Presented is an alternative approach to dam models stemming from the theory of gambling. A dam model is proposed for which it is assumed that the conditional distributions of the inputs, given the past, are known only to lie in some class M. For selected M, bounds are derived on various quantities of interest such as the mean time to first emptiness. The case of normal inputs is treated in greater detail and a release rule is discussed. The techniques used are similar to those used in the gambling theory of Dubins and Savage (1965). The approach may be particularly useful when there is little prior information on the dam inputs. The theorems presented have far-ranging potential applications to many problems in applied probability. (Bell-Cornell)
W73-05812

AN INFINITE DISCRETE DAM WITH DEPENDENT INPUTS,
Western Australia Univ., Nedlands.
H. G. Herbert.
Journal of Applied Probability, Vol 9, No 2, p 404-413, June, 1972. 11 ref.

Descriptors: *Dams, *Mathematical models, *Systems analysis, Markov processes, Water storage, Overflow.
Identifiers: *Infinite discrete dams, Moving average input, Transient behavior, Stationary behavior, First emptiness, Finite dams, Poisson distributions.

Discussed is an infinite discrete dam fed by inputs that form a moving average sequence. Generating functions are derived for the joint time dependent distribution of the content, accumulated input and total dry time, the distribution of first emptiness, and the stationary content distribution. Also investigated is the problem of first emptiness before overflow for the finite dam. The methods may be applied, with appropriate modifications, to the dam with a Markov chain input. (Bell-Cornell)
W73-05813

EVALUATION OF ALTERNATIVES FOR SOLID WASTE SYSTEMS,
Wisconsin Univ., Green Bay.
For primary bibliographic entry see Field 05E.
W73-05814

THE COMPUTER AS AN AID TO ENVIRONMENTAL PLANNING,
University Coll. of Swansea (Wales). Dept. of Civil Engineering.
For primary bibliographic entry see Field 07C.
W73-05815

SYSTEM SIMULATION TO TEST ENVIRONMENTAL POLICY: DDT,
Alfred P. Sloan School of Management, Cambridge, Mass.
For primary bibliographic entry see Field 05B.
W73-05817

6B. Evaluation Process

WATER RESOURCES PLANNING AND THE PUBLIC INTEREST: A THEORETICAL AND EMPIRICAL FORMULATION,
Cornell Univ., Ithaca, N.Y. Water Resources and Marine Sciences Center.
R. J. Kalter.
Available from the National Technical Information Service as PB-214 679, $3.00 in paper copy, $0.95 in microfiche. Water Resources and Marine Sciences Center Technical Report No. 44, 1972. 2 p. OWRR B-026-NY (1). 14-31-0001-3312.

Descriptors: *Public benefit, *Planning, Welfare (Economics), *Decision making, *Multiple-purpose projects, Evaluation.

Recent efforts to expand the formal evaluation criterion for water resource investments from economic efficiency to multiple objectives, have often been made in the absence of a clear understanding of the operation of the current decision-making process. This project sought to identify the factors which characterize the current planning process (specifically in the Army Corps of Engineers), and then suggest changes in that process which would encourage the effective use of multiobjective planning. Theories from economics and political science were reviewed to identify a set of concepts to serve as a guide for an empirical investigation of the decision-making process. Next, a single case study was conducted to test the usefulness of the conceptual foundations, as well as develop general insights about the planning process. Finally, a study was conducted in which the number of case studies was expanded to four. Case specific insights about the decision-making process were supplemented by interviews with participants in water resource planning, reading of congressional hearings and reading of secondary studies. Conclusions were drawn about the ability of the current institutional system to use multiobjective planning, and some changes were recommended in that system.
W73-05208

WATER RESOURCE PROJECT SELECTION AT THE LOCAL, STATE, AND FEDERAL LEVELS,
Urban Systems Research and Engineering, Inc., Cambridge, Mass.
B. Collins, J. R. McGibbon, and C. Binkley.
Available from the National Technical Information Service as PB-214 787, $3.00 in paper copy, $0.95 in microfiche. Final Report, January 1973.

188 p, 5 fig, 13 tab, 155 ref, append. OWRR C-3205 (3702) (1). 14-31-0001-3702.

Descriptors: *Administration, *Decision making, *Project post-evaluation, *Project purposes, Water policy, *Project planning.
Identifiers: Boston, Miami, Phoenix, Tucson.

A broad examination of the water resource project selection process was undertaken, based in part on case studies of the Boston, Miami Phoenix, and Tucson metropolitan areas. The project selection process, as currently structured, is not well suited to formal resource allocation models. Problems typically arise sequentially, generally in crisis situations. The problems are narrowly formulated, and innovative alternative solutions are seldom considered. The decision point is generally diffuse as administrators over-delegate their authority. State and federal programs, including those created by recent federal legislation, not only fail to ameliorate this situation but may actually contribute to it. The study makes a broad range of recommendations to local decision-makers, describing proper participants in the planning process, informational requirements for anticipating needs, some innovative alternative solutions to problems, and various technical and non-technical factors which should be considered in making a selection. A new, mathematical approach to project selection based on consensus ranking of alternative projects is also proposed. These recommendations are developed and implications for federal policy are described. (See also W73-05210)
W73-05209

WATER RESOURCES PROJECT SELECTION: A HANDBOOK FOR ADMINISTRATORS.
Urban Systems Research and Engineering, Inc., Cambridge, Mass.

Available from the National Technical Information Service as PB-214 654, $4.50 in paper copy, $0.95 in microfiche. Report, January 1973, 53 p, 2 fig, 7 ref, append. OWRR C-3205 (3702) (1).

Descriptors: *Administration, *Decision making, *Project post-evaluation, *Project purposes, Water policy, Publications, *Project planning.
Identifiers: *Handbook (administration), *Project selection.

The handbook is addressed to administrators (or commissioners) in agencies, districts or other governmental units charged with water-related functions. It seeks to help them take a more effective part in the project selection process. The handbook outlines rational stages in the decision making process and describes the current failure of most agencies to make decisions in this rational way. It recommends who should make decisions and who should advise the decision maker at each stage of the decision making process. It then describes in greater detail how the decisions should be made. In particular, the handbook presents some innovative engineering and non-engineering water resource strategies and describes the factors to be considered in assessing both these and more traditional approaches. Finally, it describes some actions that administrators can take to improve the structure of water resources institutions. (See also W73-05209)
W73-05210

SOCIAL ASPECTS OF URBAN WATER CONSERVATION,
Century Research Corp., Arlington, Va.
For primary bibliographic entry see Field 03D.
W73-05211

HYDROLOGIC AND HYDRAULIC SIMULATION IN WATERSHED PLANNING AND PLAN IMPLEMENTATION,
Southeastern Wisconsin Regional Planning Commission, Waukesha.
S. G. Walesh.
Paper, American Society of Civil Engineers Hydraulics Division Special Conference, Ithaca, NY, Aug 1972. 34 p, 8 fig, 2 tab, 17 ref, append.

Descriptors: *Stimulation analysis, *Computer models, *Small watersheds, Models, Hydrologic data, Flood forecasting, Flood stages, Flood routing, Wisconsin, Watersheds (Basins), Streamflow, Algorithms, Flood plain zoning, Land use, Flood plain insurance, Bibliographies, Watershed management, Hydrology.
Identifiers: *Hydrologic models, *Drainage basins, Flood hydrology.

Hydrologic and hydraulic simulation with a digital computer is an effective technique applied by the Southeastern Wisconsin Regional Planning Commission in comprehensive watershed planning. The Commission's experiences with simulation of 3 watersheds of 197, 694, and 939 sq mi are summarized. Examples illustrate techniques used to calibrate a simulation model, and procedures for using the model to: (1) determine flood discharges and stages for delineating floodlands, (2) provide stage-frequency information to compute flood damages, (3) test alternative structural flood control measures, (4) assess hydraulic adequacy of bridges and culverts, (5) determine effect of changing land use, and (6) synthesize low flows. Applications of simulation in plan implementation and refinement are illustrated. Refinement of flood stage profiles and floodland mapping, preparation of Federal flood insurance reports, dissemination of flood hazard information, and flood forecasting are also discussed. Success in simulation depends upon accepting voluminous data requirements, and making intensive searches for historic discharge, stage, and inundation information. (USBR)
W73-05345

THE CONCEPT INSTITUTION IN WATER MANAGEMENT USAGE,
Colorado State Univ., Fort Collins. Dept. of Political Science.
For primary bibliographic entry see Field 06E.
W73-05349

ALTERNATIVES TO THE HEATING AND EVAPORATION OF GROUNDWATER WHILE STILL SATISFYING THE U.S. ENERGY APPETITE,
For primary bibliographic entry see Field 05C.
W73-05350

A STUDY OF THE ANTELOPE VALLEY, THE SANTA CLARITA VALLEY, AND THE SAN GABRIEL MOUNTAINS OF LOS ANGELES COUNTY.
Los Angeles County Regional Planning Commission, Calif.

Interim Development Guide and Program for Waste and Water Management, June 1971. 74 p, 13 fig, 1 tab, 42 ref, append.

Descriptors: *Water supply, *Drainage systems, *Sewerage, *Planning, Solid wastes, Urbanization, Flooding, Groundwater, Recycling, California.
Identifiers: *Environmental quality, *Los Angeles County, Palmdale Intercontinental Airport, Antelope Valley, Santa Clarita Valley, San Gabriel Mountains.

Analyses and plans are presented for water supply, storm water drainage, sanitary sewerage, and solid waste disposal systems for the northern part of Los Angeles County. This part of the county has some desert and mountain areas and presently has only 2% of the county's population. However, rapid suburbanization is taking place and the proposed Palmdale Intercontinental Airport is expected to attract major urban concentrations. Two significant problems related to this future development are the limited quantities of water available and the extensive valley areas subject to flooding. Some of the recommendations include the quick completion of drainage studies and implementation of construction programs, the use of recycled water to relieve over-drafting of groundwater, and the preservation of agricultural and recreational land. Plans and recommendations are based on a set of goals established in an earlier report, Environmental Development Guide, and emphasize environmental quality. (Elfers-North Carolina)
W73-05386

LOS ANGELES COUNTY PROGRAMS FOR WATER DISTRIBUTION, DRAINAGE CONTROL, SEWERAGE AND WATER RECLAMATION SYSTEMS, REFUSE FACILITIES.
Los Angeles County Regional Planning Commission, Calif.

Technical Report, Interim Water and Waste Management Program. July 1971. 101 p, 7 fig, 9 tab, 57 ref, append.

Descriptors: *Water supply, *Drainage systems, Flood control, *Sewerage, *Groundwater recharge, *Reclaimed water, Solid wastes, Recycling, Storm water, Planning, Management, California.
Identifiers: *Storm water detention, *Los Angeles County, Management consolidation.

An earlier report, Environmental Development Guide, is intended to help implement the County General Plan Proegram. This report identifies the major programs and systems in Los Angeles County for water supply and distribution, drainage and flood control, sewerage and wastewater reclamation, and solid waste disposal. It inventories the present state of these systems, provides preliminary plans for new systems, and proposes construction projects for the next decade. Although water and sewerage facilities are adequate in the Los Angeles urban core area at present, about 2 million more people are projected for the county by 1990. The importance of wastewater reclamation, groundwater recharge and stormwater detention, and the consolidation of the over 500 separate water management agencies is stressed. (Elfers-North Carolina)
W73-05387

SHORELINE RESOURCE DEVELOPMENT: A PRELIMINARY REPORT OF COASTAL MANAGEMENT AND LAND PLANNING FOR THE TAMPA BAY REGION.
Tampa Bay Regional Planning Council, St. Petersburg, Fla.

Comprehensive Report, no. 11 of 1971 Work Program. 72 p, 17 fig, 6 tab. HUD CPA-Fla. p-149.

Descriptors: Shore protection, Beach erosion, Marsh management, Marshes, *Land use, *Environmental effects, *Land development, Flood plains, Tidal waters, *Estuarine environment, *Urbanization, *Political aspects, *Local governments, Aquatic environment, *Wetlands, Florida.
Identifiers: *Tampa Bay (Fla.), Coastal coordinating committee, Aquatic preserves.

The focus is on the management and control of new land development on the shorelines and coastal wetlands around and near Tampa Bay. Discussions are included of the enviroamental setting of the Bay area such as climate, geology, hydrology, estuarine processes, beach erosion, water pollution, and the tourist attractions. The key sections deal with the planning and control of land use and new development. The need for planning and controls is based on the limited local supplies of fresh water and the fragile nature of the shorelands and wetlands. Three broad catego-

ries of land are identified: marshes and shellfish waters to be protected; floodplains to be conserved; and areas suitable for urban development provided that special utility systems are constructed. Two plans for the Bay area are outlined: one in which the vulnerability of the shorelands and wetlands is emphasized and most of it is protected or conserved, and another in which economic and political realities are taken into account and only highly critical areas are protected. The implementation of these plans and their policies is seen to rely on increasingly responsible local governments, a coastal coordinating committee, delineation of estuarine areas and guidelines, and the use of a state program of creating aquatic preserves. (Elfers-North Carolina)
W73-05388

MASTER SEWERAGE SYSTEM PLAN FOR METROPOLITAN MANILA,
Black and Veatch, Kansas City, Mo.
For primary bibliographic entry see Field 05D.
W73-05417

THE DEVELOPMENT OF MARINA DEL REY,
University of Southern California, Los Angeles. Coastal Zone Planning and Management Project.
G. P. Schultz, M. P. McCoy, and K. J. O'Brien.
Available from the National Technical Information Service as COM-72-11133, $3.00 in paper copy, $0.95 in microfiche. Sea Grant Program Publication No USC-SG-5-72, 1972. 114 p, 28 ref. USDC Grant No 2-35227.

Descriptors: *Marinas, *Recreation facilities, *Water sports, *Land development, *California, Coasts, Reviews, Costs, Economics, Resources development, Planning, Community development, Population, Boating, Docks, Construction, Environmental effects, Management, Design criteria.
Identifiers: *Marina del Rey (Calif).

This report is one of a series focused on the Marina del Rey. The Marina del Rey, on Santa Monica Bay in Los Angeles County, is one of the largest manmade small craft harbors in the world, containing 375 acres of land and 405 acres of water. It is expected to have about 6,000 boats in slips and hundreds more in dry storage. Beyond this, it is a/small community in itself with a resident population of 10,000 and a seasonal daytime population of about 30,000. The decisions which created Marina del Rey are reviewed, described, and when possible, interpreted. Difficulties and problems of the past, the present, and a few that seem imminent in the future are described. Marina del Rey is a well established, financially stable, extremely busy, large scale development which is known the world over. (Woodard-USGS)
W73-05690

PROGRAM DESIGN-1971, SAN FRANCISCO BAY REGION ENVIRONMENT AND RESOURCES PLANNING STUDY.
Geological Survey, Washington, D.C.

Available from NTIS, Springfield, Va 22151 as PB-206 826 Price $3.00 paper copy; 95 cents microfiche. Geological Survey-Department of Housing and Urban Development Research and Technology Cooperative Report, October 1971. 123 p, 5 fig.

Descriptors: *Environmental control, *Urbanization, *Programs, *Planning, *California, Bays, Oceanography, Geology, Mineralogy, Seismology, Hydrology, Limnology, Water quality, Water pollution control, Water resources development, Water supply, Flood control, Waste disposal, Land development, Management.
Identifiers: *San Francisco Bay region (Calif), *Program design.

A comprehensive guide to a study of the 9-county San Francisco Bay Region describes a 4-year research-demonstration study conducted jointly by the Geological Survey and the Department of Housing and Urban Development, designed to improve urban development decisions and land-use planning through application of innovative earth science concepts. The Program Design is a detailed description of the science and planning elements which make up the study. It also shows the organizational and management structure for conducting the study and facilitating communications with user agencies. Urban-related environmental studies include: active faults and earthquake hazards, landslides and slope instability, physical and chemical properties of San Francisco Bay and its circulation patterns, water-quality and pollution, areas subject to flooding, water supply and waste-disposal systems, and available mineral and water resources. Planning program elements include state-of-the-art review and analysis, a feasibility study of incorporating earth-science data into urban planning information systems, and application and demonstration studies. (Woodard-USGS)
W73-05691

PROCEEDINGS--COMMUNITY WORKSHOP ON FLOOD INSURANCE.
Virginia Polytechnic Institute and State University, Blacksburg, Virginia. Water Resources Research Center.
For primary bibliographic entry see Field 06F.
W73-05740

PLANNING NATURAL RESOURCE DEVELOPMENT, AN INTRODUCTORY GUIDE,
Economic Research Service, Washington, D.C.
G. A. Pavelis.
Agriculture Handbook No 431, May 1972. 29 p, 7 tab, 34 ref, 1 append.

Descriptors: *Natural resources, *Water resources development, *Planning, Economics, Projects, Project feasibility, Tangible benefits, Intangible benefits, Economic impact.
Identifiers: *Natural resources development.

Basic economic concepts and principles for making rational decisions on the scope, content, and scale of natural resource development programs are described and illustrated. The efforts are designed to (1) clarify and sharpen conceptual and procedural issues relating to the impact and effectiveness of public investments, and (2) assist in the development of systematic approaches to planning and evaluation. The first part of the study discusses concepts and procedures for selecting feasible components of development programs. The second part presents criteria for identifying an inital array of feasible project proposals. Priorities are assigned to preliminary development projects or components on the basis of tangible and intangible benefits and costs. Next, methods for formulating preliminary single-purpose or multipurpose programs are explained. Concluding sections reexamine the preliminary programs for further possibilities of integrating program purposes, and show how a recommended final program might influence the income and other economic accounts of an economy. Development of the final project is planned according to the amount of money available. Throughout the analysis various points are illustrated with such hypothetical examples as an irrigation project, a flood-control levee, and an urban water supply project. (Settle-Wisconsin)
W73-05741

'A THEORETICAL NOTE ON THE CAPACITY OF THE MARKET SYSTEM TO ABATE POLLUTION': REJOINDER,
Texas A and M Univ., College Station. Dept. of Economics.
For primary bibliographic entry see Field 05G.
W73-05744

A PRELIMINARY ESTIMATE OF THE ECONOMIC POTENTIAL OF MARINE PLACER MINING,
California Univ., Santa Barbara.
S. M. Wilcox, W. J. Mead, and P. E. Sorensen.
In: 'Preprints,' Annual Conference and Exposition, Marine Technology Society, September 11-13, 1972, Washington, D.C., p 499-506. 3 tab, 8 ref.

Descriptors: *Placer mining, *Mining, *Oceans, *Costs, Mineral industry, Profit, Dredging, Gold.
Identifiers: *Marine placer deposits, Platinum, Ilmenite, Chromite.

The costs and benefits of mining marine placer deposits are analyzed. Placer deposits consist of several relatively heavy minerals that are deposited surficially on the ocean floor. The minerals whose economic potential is considered highest are gold, magnetite, platinum, ilmenite, and chromite. Cost estimates are made for 9, 18, and 54 cubic foot bucket line dredges, which are assumed to operate 170 to 291 days per years. Estimated capital costs are approximately $28,200,000 for the 9 cubic foot dredge, $47,700,000 for the 18 cubic foot, and $102,950,000 for the 54 cubic foot. Operating costs for 170 days are approximately $7 million, $13 million, and $38 million for the three dredges, respectively. Operating costs for 291 days are about $11 million, $20 million, and $54 million for the three bucket sizes. These estimates indicate that operating costs would be greater than operating revenue for all dredge sizes and for both operating periods. The present value of the total net loss of the largest dredge operating 291 days over a 20-year period amounts to $154 million. Losses for the 18 and 9 foot dredges for the same period are $78 million and $48 million, respectively. (Settle-Wisconsin)
W73-05745

SYSTEMS DYNAMICS AS A TOOL FOR RESOURCE MANAGEMENT: ATLANTIC MENHADEN FISHERY CASE STUDY,
Massachusetts Inst. of Tech., Cambridge. Charles Stark Draper Lab.
P. S. Weissman, G. R. Kalan, and D. A. Platts.
In: 'Preprints,' Annual Conference and Exposition, Marine Technology Society, September 11-13, 1972, Washington, D.C., p 255-276. 8 fig, 12 ref.

Descriptors: *Natural resources, *Management, *Mathematical models, *Fisheries, Systems analysis, Computers, Fish management, Atlantic menhaden.
Identifiers: *Systems dynamics.

Resource management problems are made difficult by several characteristics of ecological and economic systems. Problems arise because these systems contain large numbers of interacting variables, significant nonlinearities, delays, random exogenous influences, spatial considerations, and ill-defined objectives. 'Systems dynamics' is a management research tool which seems capable of overcoming most of these problems. The initial step in the systems dynamics approach is to clearly define the problems and the objectives. The second step is to define the boundaries of the system to be studied. In the third step, the elements of the system are defined and related to each other without specifically formulating their relationships. The fourth step is to determine the equations which indicate how each element is derived from the values of the other elements at any particular moment. Once these equations have been programmed and the model tested, suggestions and alternative formulations can be incorporated into the model without difficulty. This management tool is illustrated through an application to the Atlantic menhaden fishery. The model was used to develop a hypothetical regulatory policy for the fishery. (Settle-Wisconsin)
W73-05746

FLOOD RISK AND AGRICULTURAL LAND VALUES: A TEST,
National Bureau of Economic Research, New York.
For primary bibliographic entry see Field 03F.
W73-05748

SCIENCE, TECHNOLOGY, AND DEVELOPMENT, VOLUME III, AGRICULTURE.

Available from the National Technical Information Service as PB-207 496, $3.00 in paper copy, $0.95 in microfiche. Geneva, Switzerland, 1962. 262 p.

Descriptors: *Agriculture, *Irrigation, *Fisheries, Research and development, Technology, Boats, Fishing gear, Transportation.
Identifiers: *Fishery products, Sanitary procedures.

The third volume of the twelve-volume set of United States papers prepared for the 1963 United Nations Conference on the Application of Science and Technology for the Benefit of the Less Developed Areas focuses on agriculture. The volume's 23 papers are divided into the following 7 categories: Institutional and Social Aspects of Agricultural Development (7 papers); Improvements in Levels of Nutrition (3 papers); Development of Land and Water Resources (2 papers); Crop Production and Protection (5 papers); Animal Health and Breeding (2 papers); Forestry (1 paper); and Fishery Resources and Production (3 papers). Four papers have particular relevance to water resources economics. They are titled (1) Transforming Irrigation from an Age-Old Art into a Modern Science Through Research and Technology; (2) Development of Modern Fisheries: Experiences in the United States; (3) Improvement of Production and Preservation Methods in an Underdeveloped Fishery Through Upgrading Fishing Vessels, Gear, and Sanitary Procedures; and (4) Ocean Fishery Products and Their Inland Transport in Less Developed Areas. (See W73-05751 thru W73-05754) (Settle-Wisconsin)
W73-05750

TRANSFORMING IRRIGATION FROM AN AGE-OLD ART INTO A MODERN SCIENCE THROUGH RESEARCH AND TECHNOLOGY,
California Univ., Davis. Dept. of Irrigation.
R. M. Hagan.
In: Science, Technology and Development, Volume III, Agriculture, UN Conference on the Application of Science and Technology for the Benefit of the Less Developed Areas, 1962, p 126-136. 6 fig, 11 ref.

Descriptors: *Irrigation, *Methodology, *Planning, Research and development, Technology, Agriculture, Water supply.
Identifiers: *Tradition, *Science.

Appropriate applications of science and technology can transform irrigation from an age-old art into a modern science capable of providing the basis for productive irrigation projects. In many parts of the world, traditional irrigation practices lead to such problems as water supply failure, erosion and siltation of water storage and conveyance structures, excessive applications of irrigation water, leaching of soil nutrients, rising groundwater tables, waterlogged soil, and the accumulation of toxic salts. An intelligent application of modern irrigation science and technology would help avoid these problems by accelerating the effective utilization of water and soil resources in developing areas and by encouraging maximum crop production from available water supplies. It would also foster an abundant and permanently successful irrigation agriculture, and help reclaim many previously productive lands that are presently waterlogged or salinized. Various principles and applications of modern irrigation science are briefly discussed. One important aspect of the science is its ability to predict what results can be expected in given situations. This predictive methodology is presently available for evaluating irrigation sites, determining the suitability of proposed irrigation waters, estimating irrigation requirements of crops, diagnosing drainage needs, and estimating leaching requirements. (See also W73-05750) (Settle-Wisconsin)
W73-05751

DEVELOPMENT OF MODERN FISHERIES: EXPERIENCE IN THE UNITED STATES,
Bureau of Sport Fisheries and Wildlife, Highlands, N.J. Sandy Hook Marine Lab.
L. Walford.
In: Science, Technology and Development, Volume III, Agriculture, UN Conference on the Application of Science and Technology for the Benefit of the Less Developed Areas, 1962, p 235-248. 1 tab.

Descriptors: *Fisheries, *Technology, *Research and development, United States, Refrigeration, Water pollution.
Identifiers: *Fishery products, Fish meal, Fish oil, Fish protein, Canning, Menhaden, Pacific sardine.

Fisheries in the United States have paralleled the history of the nation, advancing from very primitive operations to highly productive and technically advanced industries. Changes have occurred in the design and operation of vessels and fishing equipment, the techniques of preservation, the quality of the products, the procedures of marketing, and the facilities of transportation. The leading fisheries are those which developed specifically to supply the requirements of industries established for processing and preserving aquatic food products. The industries creating the derived demand for fishery products are based on (1) the manufacture of fish meal, oil, and protein concentrates; (2) the canning of fishery products; (3) refrigeration; and (4) salting, smoking, and pickling of marine products. The development of other industries has, on occasion, adversely affected our fisheries. Chemical and industrial wastes are sometimes strong enough to spoil the flavor of fish and shellfish living near the disposal area, and sometimes waste kills them by removing oxygen from the water. To illustrate many of these generalities about fishery development two case histories of United States fisheries are discussed, the menhaden fishery and the Pacific sardine fishery. (See also W73-05750) (Settle-Wisconsin)
W73-05752

IMPROVEMENT OF PRODUCTION AND PRESERVATION METHODS IN AN UNDERDEVELOPED FISHERY THROUGH UPGRADING FISHING VESSELS, GEAR AND SANITARY PROCEDURES,
Bureau of Commercial Fisheries, Washington, D.C.
C. Butler, H. B. Allen, and L. Alverson.
In: Science, Technology and Development, Volume III, Agriculture, UN Conference on the Application of Science and Technology for the Benefit of the Less Developed Areas, 1962, p 249-255.

Descriptors: *Fisheries, *Investment, Distribution, Planning, Fishing.
Identifiers: *Emerging nations, Production, Development.

Methods for improving the fish harvest in nonindustrialized coastal nations are discussed. Old and established, but nonetheless inefficient, catching, processing, and marketing methods presently hinder the growth and development of fishery products markets in these countries. Consequently, better techniques for the production and preservation of fish need to be introduced in the emerging nations. A national program for industrial development of the fisheries should include sub-programs aimed at (1) improving existing fishing gear, (2) educating fishermen in the best uses of contemporary fishing gear, (3) training net-manufacturing and vessel-repair teams, (4) obtaining an exploratory deep-water fishing vessel in order to inventory the domestic marine resources, (5) planning for the construction of shore facilities capable of processing and distributing products of the fisheries program, (6) training cadres in outboard motor maintenance and in transom-stern boat maintenance, (7) educating fishermen in primitive preservation and sanitation techniques for use on existing vessels and products, (8) training personnel for later development programs, and (9) developing sources of international assistance in financing plant and vessel construction and in procurement of processing and distribution equipment. (See also W73-05750) (Settle-Wisconsin)
W73-05753

OCEAN FISHERY PRODUCTS AND THEIR INLAND TRANSPORT IN LESS DEVELOPED AREAS,
Van Camp Foundation, San Diego, Calif.; Washington, Univ., Seattle. Dept. of Economics; Bureau of Commercial Fisheries, College Park, Md. National Center for Fish Protein Concentrate; and National Academy of Sciences, Washington, D.C.
W. M. Chapman, J. Crutchfield, D. G. Snyder, and R. B. Keating.
In: Science, Technology and Development, Volume III, Agriculture, UN Conference on the Application of Science and Technology for the Benefit of the Less Developed Areas, 1962, p 256-262.

Descriptors: *Fisheries, *Marketing, Transportation, Fish, Fishing, Proteins, Population, Systems analysis.
Identifiers: *Fishery products, Protein deficiency, Markets.

Large segments of the world's population suffer from a severe dietary deficiency of animal protein. This condition persists despite the fact that most of the protein-starved population centers are located in coastal regions, and thus have access to the protein-rich fishery products. Areas failing to take full advantage of this protein source include Peru, West Africa, India, and Southeast Asia. To increase the economic utilization of marine resources in these areas will require (1) a unified method of analyzing the barriers to fishery development, and (2) a recognition of the need for biological, technological, economic, and engineering skills in developing a consistent, balanced program. Vital to the success of fishery development programs is the degree of mobility and accessibility provided by regional and national transportation systems. Thus, a detailed evaluation of the functional characteristics of the transport and distribution system must be an integral part of overall planning. Many of the marketing and transportation obstacles which currently prevent the development of fishery programs may be partially overcome through the production and distribution of fish protein concentrates. (See also W73-05750) (Settle-Wisconsin)
W73-05754

EXTENDING UTILITY OF NON-URBAN WATER SUPPLIES,
Utah State Univ., Logan.
For primary bibliographic entry see Field 03B.
W73-05755

THE ECONOMIC IMPACT OF POLLUTION CONTROL, A SUMMARY OF RECENT STUDIES.
For primary bibliographic entry see Field 05G.
W73-05756

THE ECONOMIC SIGNIFICANCE OF THE RHINE-MAIN-DANUBE WATERWAY,
European Economic Commission, Geneva (Switzerland).
I. E. Seiler.
Bulletin of the Permanent International Association of Navigation Congresses, Brussels, Belgium, No 11, p 51-53, 1972.

Descriptors: *Rivers, *Investment, Cost-benefit analysis, Evaluation.
Identifiers: *Waterways, *Rate of return, Germany, *Rhine-Main-Danube waterway.

A study of technical problems and economic aspects of the Rhine-Main-Danube waterway is summarized. The study is divided into five major sections. Section I discusses how development of the waterway will have beneficial spillovers into other sectors of the economy. Section II discusses certain technical problems such as trends in the development of inland navigation and the structural configuration of the waterway. Section III is concerned with the economy and traffic movement within the spheres of influence of the waterway. Section IV examines the future traffic volume on the Nuremberg-Ratisbon reach. Section V compares costs and benefits of the waterway. Factors included on the cost side are (1) building costs for the Nuremberg-Ratisbon reach, (2) building costs of harbors and landings, (3) losses due to traffic changes, and (4) overhead charges. Benefits include (1) savings in transport cost, (2) profits derived from the waterway, (3) profits accuring from the increase in inhabitants' income, and (4) the credit balance at the year 2000, the end of the evaluation period. The economic return to all the bordering states is approximately 6.3 percent. (Settle-Wisconsin)
W73-05757

THE MAIN-DANUBE CANAL,
I. R. Kuhn.
Bulletin of the Permanent International Association of Navigation Congresses, Brussels, Belgium, No 11, p 67-69, 1972.

Descriptors: *Canal, *Multiple-purpose projects, Ships, Locks, Economic efficiency, Planning, Water resources development.
Identifiers: *Rhine-Main-Danube Canal, Germany.

The object of the Rhine-Main-Danube Canal is to link the basins of the Rhine and Danube via the Main, thus creating a high-capacity waterway extending across the European continent. As a multipurpose undertaking, the canal will serve both shipping and the transfer of water. The middle section of the canal between Nuremberg and the uppermost reach rises steeply, and thus requires either a vertical lift, a longitudinal lift, or staircase locks. Based on the criteria of reliability of operation, capacity, and cost, the staircase locks offer the most advantages. Planning for the level reaches of the canal involved consideration of such technical aspects as (1) the optimal dimensions for the canal cross-section, (2) lining of the canal bed, (3) canal alignment and curve width, and (4) crossing structures. Planning for the canal locks likewise involved consideration of many technical aspects including (1) water level fluctuations, (2) chamber and side ponds, (3) heads, (4) training works and lay-bys, (5) gates and sluices, (6) pump station and spill channel, and (7) associated equipment. (Settle-Wisconsin)
W73-05758

OHIO CONSOLIDATED GRANT ANALYTICAL REPORT.
Water Resources Council, Washington, D.C.
For primary bibliographic entry see Field 06E.
W73-05760

AN ECONOMIC ANALYSIS OF CENTER-PIVOT SPRINKLER SYSTEMS IN SOUTHEASTERN WYOMING, WITH EMPHASIS ON FINANCING ALTERNATIVES,
Wyoming Univ., Laramie. Div. of Agricultural Economics.
For primary bibliographic entry see Field 03F.
W73-05764

ECONOMICS OF CHAPARRAL MANAGEMENT IN THE SOUTHWEST,
Forest Service (USDA), Tucson, Ariz. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 03B.
W73-05779

EVALUATION OF HARBOR DEEPENING PROJECTS,
Calcutta Port Commissioners (India).
S. K. Bhattacharya, and A. N. Biswas.
Journal of the Waterways, Harbors, and Coastal Engineering Division, American Society of Civil Engineers, Vol. 99, No. WW1, Paper 9575, p 111-123, Feburary, 1973. 7 fig, 1 tab, 18 equ, 11 ref, 2 appen.

Descriptors: *Harbors, Projects, *Dredging, *Channels, Economics, *Evaluation, *Simulation analysis, *Cost-benefit ratio, Equations, Benefits, Optimum development plans, Mathematical models, Systems analysis.
Identifiers: Economic analysis, Deep-dock systems, *Haldia (India).

World shipping trends show that large vessels are being progressively commissioned for the transport of basic raw materials such as ores, petroleum, and fertilizers due to the low cost of transportation in such carriers. Consequently, a need has arisen for deepening approach channels to ports to accomodate these vessels. This requires a large capital investment. The importance of evaluating these projects prior to their execution is being realized; a simulation model that permits such evaluation is presented. General equations to determine costs and benefits are developed; the model applies the methodology to the subsidiary dock system at Haldia, about 57 miles seaward of Calcutta, India. The approach presented should provide a number of alternatives from which the optimum may be chosen. (Bell-Cornell)
W73-05811

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

THE ECONOMIC IMPACT OF POLLUTION CONTROL, A SUMMARY OF RECENT STUDIES.
For primary bibliographic entry see Field 05G.
W73-05756

THE ROLE OF WATER AND SEWER EXTENSION FINANCING IN GUIDING URBAN RESIDENTIAL GROWTH,
Tennessee Univ., Knoxville.
For primary bibliographic entry see Field 03D.
W73-05759

THE CEMENT INDUSTRY: ECONOMIC IMPACT OF POLLUTION CONTROL COSTS, VOLUMES I AND II.
Boston Consulting Group, Inc., Mass.
For primary bibliographic entry see Field 05G.
W73-05761

THE LEATHER INDUSTRY: A STUDY OF THE IMPACT OF POLLUTION CONTROL COSTS, (VOLUMES I, II, AND III).
Urban Systems Research and Engineering, Inc., Cambridge, Mass.
For primary bibliographic entry see Field 05G.
W73-05762

AN ECONOMIC ANALYSIS OF CENTER-PIVOT SPRINKLER SYSTEMS IN SOUTHEASTERN WYOMING, WITH EMPHASIS ON FINANCING ALTERNATIVES,
Wyoming Univ., Laramie. Div. of Agricultural Economics.
For primary bibliographic entry see Field 03F.
W73-05764

ECONOMIC ASPECTS OF SLUDGE DEWATERING AND DISPOSAL,
Colorado Univ., Boulder. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 05D.
W73-05808

EFFECT OF WATER WELL EFFICIENCY ON COST.
Universla Oil Products, St. Paul, Minn. Johnson Div.
For primary bibliographic entry see Field 04B.
W73-05829

6E. Water Law and Institutions

WATER RESOURCES PLANNING AND THE PUBLIC INTEREST: A THEORETICAL AND EMPIRICAL FORMULATION,
Cornell Univ., Ithaca, N.Y. Water Resources and Marine Sciences Center.
For primary bibliographic entry see Field 06B.
W73-05208

WATER RESOURCE PROJECT SELECTION AT THE LOCAL, STATE, AND FEDERAL LEVELS,
Urban Systems Research and Engineering, Inc., Cambridge, Mass.
For primary bibliographic entry see Field 06B.
W73-05209

WATER RESOURCES PROJECT SELECTION: A HANDBOOK FOR ADMINISTRATORS.
Urban Systems Research and Engineering, Inc., Cambridge, Mass.
For primary bibliographic entry see Field 06B.
W73-05210

FEDERAL EVALUATION OF RIPARIAN PROPERTY: SECTION III OF THE RIVERS AND HARBORS ACT OF 1970,
R. C. Allen.
Maine Law Review, Vol 24, p 175-214, 1972. 151 ref.

Descriptors: *Rivers and Harbors Act, *Riparian rights, *Compensation, *Legislation, Judicial decisions, Federal government, Legal aspects, Eminent domain, Riparian land, Ownership of beds, Federal jurisdiction, Navigable rivers, Federal Power Act, Beds under water, Flood control, Recreation, Water supply, Streambeds, High water mark.

Section III of the Rivers and Harbors Act of 1970 allows compensation for the water-related value of riparian land. Under the doctrine of navigation servitude, and before enactment of section III, no federal compensation was due anyone for the taking of otherwise legitimate property interests. A specific background is provided of the judicially evolved concept of navigation servitude. Also included is discussion of the parameters within which Congress may exercise its commerce powers over navigable waterways, as well as the evolution and extent of the doctrine of navigation servitude itself. Section III is criticized on two

principal grounds. First, only riparian interests are compensable; not interests below the high water mark. It seems to be a denial of essential fairness that riparian owners are the only members to receive a special benefit. Second, there remains the nagging notion that the public is being required to pay for what already belongs to the public. It would have been better to study the whole circumstance, isolate inequities, and then propose specific solutions. (Tolle-Florida)
W73-05223

NOTE: THE MINNESOTA POLLUTION CONTROL AGENCY--A STUDY IN STATE ADMINISTRATIVE LAW.
For primary bibliographic entry see Field 05G.
W73-05224

OCEAN DUMPING OF WASTE MATERIALS.
For primary bibliographic entry see Field 05E.
W73-05225

OCEAN DISPOSAL OF UNSERVICEABLE CHEMICAL MUNITIONS.
For primary bibliographic entry see Field 05E.
W73-05226

EVERGLADES--BIG CYPRESS NATIONAL RECREATION AREA, PART II.
For primary bibliographic entry see Field 05G.
W73-05227

ANNUAL REPORTS OF CEQ.
For primary bibliographic entry see Field 05G.
W73-05228

WATERSHED PROJECTS--1970.
Hearing--Subcomm. on Watershed Development--Comm. on Public Works, U.S. House of Representatives, Ninety-first Congress, July 16, 1970. 22 p, 2 tab.

Descriptors: *Watershed management, *Flood control, *Water supply development, *Watersheds (Basins), Legislation, Planning, Water resources development, Water management (Applied), Water control, Flood protection, River control, Water supply, Dependable supply, Area redevelopment.
Identifiers: *Congressional hearings.

In these hearings Congressmen stated their reasons for supporting certain watershed projects within their states. The Subcommittee also received the statements of other interested parties. The following watershed project proposals were under consideration by the Subcommittee: Rocky Creek in South Carolina, West Branch of the Westfield River in Massachusetts, Clear Creek in Illinois, Upper Turtle River in North Dakota, Hog Creek in Texas, Bahala Creek in Mississippi, North Oconee in Georgia, Chattooga River in Georgia, McKay-Rock Small in Oregon, Lost River in Indiana, Spadra Creek, Upper Petit Jean and Upper Ocochiba River in Arkansas. Most of the projects are designed to give flood protection and create dependable supplies of water to encourage area development. (Reed-Florida)
W73-05230

FEDERAL RESEARCH IN POTABLE-WATER TECHNOLOGY--JOINT DISCUSSION,
For primary bibliographic entry see Field 05G.
W73-05232

BIBLIOGRAPHY OF THE 160-ACRE ANTIMONOPOLY WATER LAW,
Senate, Washington, D.C.
C. L. Smith.
Congressional Record, Vol 118, p E9134-E9138 (daily ed) Nov. 8, 1972. 5 p.

Descriptors: *Bibliographies, *Data collections, *Legislation, Documentation, Information retrieval, Publications, Reviews, Technical writing, Water law, Legal aspects, Judicial decisions.

Senator Fred R. Harris of Oklahoma included in the Record the second half of the bibliography on the 160-acre antimonopoly water law. The bibliography was prepared by Charles L. Smith. It included listings from United States statutes and court cases, congressional hearings and documents, Congressional Record entries, United States Bureau of Reclamation publications, California statutes and legislative reports, articles in California farmer and California Farmer-Consumer Reporter, recent news items, and miscellaneous articles. (Nielsen-Florida)
W73-05233

REPORT ON SUBCOMMITTEE ON AIR AND WATER POLLUTION ACTIVITY IN THE 92D CONGRESS,
Senate, Washington, D.C.
E. S. Muskie.
Congressional Record, Vol 118, p E9237-E9242 (daily ed.) Nov. 8, 1972. 6 p.

Descriptors: *Legislation, *Pollution abatement, *Sewage treatment, *Waste dilution, Water pollution control, Thermal pollution, Sludge disposal, Discharge (Water), Waste treatment, Waste water (Pollution), Effluents, Sewage effluents, Treatment facilities, Grants, Legal aspects, Water law.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972, effluent limitations.

The activities of the Senate's Subcommittee on Air and Water Pollution include legislation and oversight in the Committee on Public Works relating to air and water pollution, solid waste management and resource recovery, control of noise and other matters affecting the environment. The subcommittee was able to discern an entrenched opposition to public regulation and continued vigilence is vital to insure continued progress. Final enactment over Presidential veto of the Federal Water Pollution Control Act Amendments of 1972 was the subcommittee's most important achievement. The law specifically bans pollution dilution as an alternative to waste treatment. The law intends that a major effort be put forth to remove in place pollutants from harbors in the Great Lakes. The law authorizes $18 billion in grants to communities for construction of sewage treatment facilities. The law requires development of area-wide waste management plans with statewide planning. The act also set up a program for application and enforcement of effluent limitations. The Environmental Protection Agency is required to issue abatement orders where anyone is in violation of enumerated regulatory requirements of the act. Thermal pollutants and discharges into the oceans are also regulated by the Act. (Nielsen-Florida)
W73-05234

PRIVATE REMEDIES FOR POLLUTION OF NAVIGABLE WATERS,
R. D. Darden, Jr.
North Carolina Law Review, Vol 50, p 153-162 , 1971. 56 ref.

Descriptors: *Damages, *Penalties (Legal), *Legislation, *Legal aspects, *Judicial decisions, Navigable waters, Water pollution, Regulation, Water law, Negligence, Economics, Law enforcement, Watercourses (Legal aspects), Water pollution control.
Identifiers: Refuse Act of 1899, Nuisance (Water law), Absolute liability.

The economic burden resulting from pollution of navigable waters should be borne directly by the one who caused the pollution. As alternatives to the conventional theories of tort law, which are of limited effectiveness in water pollution situations, the theory of statutory fault under the Refuse Act of 1899, and a new form of enterprise liability, process liability, should be utilized. The theory underlying the concept of product liability furnishes the basis for the theory of process liability. When an actor elects a course of conduct which, however carefully conducted, imposes an unusual measure of risk of damage on the persons or property of others, it is reasonable to require him to carry the economic burden of the risk. The economic and social policies which led to the development of products liability are applicable to many of the non-negligently caused water polluting occurrences. (Reed-Florida)
W73-05236

ANALYSIS OF THE DECISION OF THE FLORIDA DISTRICT COURT IN THE CASE OF AMERICAN WATERWAYS OPERATORS, INC., ET AL. V. ASKEW.
For primary bibliographic entry see Field 05G.
W73-05237

ESTABLISHMENT OF CUMBERLAND ISLAND NATIONAL SEASHORE, GEORGIA.

Congressional Record, Vol 118, p. S17788-S17789 (daily ed.) October 12, 1972. 2 p.

Descriptors: *National seashores, *Legislation, *Seashores, *Recreation, Beaches, Camping, Hunting, Sport fishing, Camp sites, Land use, Natural resources, Recreation facilities, Scenic highways, Eminent domain, *Georgia.
Identifiers: Cumberland Island.

A motion that the Senate concur in the amendment of the House, to a bill establishing the Cumberland Island National Seashore in the State of Georgia, was agreed to. The amendment specified the boundaries of the project and the means by which the land might be acquired. A scheme for compensating the affected landowners was also provided. Provision was made to allow for the establishment of a natural and scenic preserve by voluntary private action. Also specified are the uses to which the project may be put. Appropriations for the project are authorized. (Reed-Florida)
W73-05238

INTERSTATE WATER COMPACT; WELL DRILLING.

Conn. Gen. Stat. Ann. secs. 25-122 thru 25-137a (Supp. 1971).

Descriptors: *Connecticut, *Legislation, *Well permits, *Administrative agencies, *Interstate compacts, Water resources, Water utilization, Interstate commissions, Investigations, Wells, Well regulations, Groundwater, Groundwater resources, Public health, Water management (Applied), Water pollution, Farms, Water distribution (Applied).

Authority is granted to the governor to enter into compacts deemed advisable for municipal water use. To assist the governor, provisions for research, investigatory, and administrative assistance have been included. Further assistance is anticipated by the creation of a ten man commission appointed by the governor, president pro tem of the senate, and speaker of the house with advisory responsibility. The well drilling legislation includes a section defining certain terms such as 'well', 'groundwater', and 'person'. The legislation also establishes a board and uses mandatory language in setting forth qualifications for board membership. In general terms, a certain amount of

expertise is required for membership. A well drilling code is established and what can be termed the legislative intent of preserving public health and promoting environmental protection is clearly written into the statute. Enforcement is mandatory and sanctions are provided by adoption of the punitive measures of the public health code. Other features of the new legislation include registration certificates, drilling permits, and constraints against pollution or depletion of underground water resources. (Bradley-Florida)
W73-05239

SUPERVISION OF DAMS AND RESERVOIRS.
Conn. Gen. Stat. Ann. secs. 25-110 thru 25-118 (Supp. 1971).

Descriptors: *Connecticut, *Legislation, *Dams, *Structures, *Inspection, Jurisdiction, Reservoirs, Investigations, Watersheds (Basins), Permits, Surveys, Maps, Structural stability, Construction, Legal review, Administrative agencies, Dam construction.

The Water Resources Commission's jurisdiction includes all dams, dikes and other similar structures, which by breaking away or otherwise, might endanger life or property. The commissioner of environmental protection is given a wide latitude to regulate and inspect dams, watersheds, sites and structures, and is given specific statutory authorization to enter private property to investigate. Inspection of dams and other structures is facilitated by statutory requirements requiring persons having responsibility for care and control of such structures to furnish plans, drawings, data, descriptions, and surveys. Private individuals and corporations may petition the commissioner for an inspection and their 'standing' to do so is broadly defined. Alteration, construction, removal, or addition to any existing structure requires a permit from the commissioner and an examination of the site is mandatory. The legislative purpose of this chapter is to ensure the safety of all structures and to assign responsibility and apportion the cost entailed. Sections specifically exempt the state from liability by reason of its supervision, and reject the possibility of insulating owners and operators from liability by reason of such supervision. Review of the commissioner's decisions is first by hearing before the commissioner, and then by appeal to the court of common pleas. (Bradley-Florida)
W73-05240

CONSERVATION.
Conn. Gen. Stat. Ann. secs. 25-103 thru 25-1096 (Supp. 1971).

Descriptors: *Connecticut, *Legislation, *Watershed management, *Erosion control, *Watersheds (Basins), Land use, Soils, Soil erosion, Easements, Leases, Local governments, Land tenure, Soil conservation, Administration, Fish, Wildlife, Recreation, Municipal water, Multiple-purpose reservoirs, Eminent domain, Streams, Interstate compacts, Administrative agencies.

This legislation includes a section defining the general duties of the commissioner of environmental protection concerning watershed management. His duties include those of an administrative and investigative nature, the obtaining of acquisition rights to property for maintenance and improvements deemed necessary, and obtaining financial resources for his activities. Works of improvement is defined to include flood prevention, including structural and land treatment measures; the conservation, development, utilization, and disposal of water, including fish, wildlife, and recreational developments; and multiple-purpose watershed projects, including reservoir construction facilities limited in size and capacity by statute. The statute envisions the undertaking of projects by local governments and provides for the commissioner's facilitation and coordination in these initiatives. Two sections of this chapter deal exclusively with compensation for acquisition of rights by the state and conveyance of real property for watershed program purposes. Authorization is granted to the commissioner to enter into interstate compacts, with the governor's approval, concerning the planning, construction, maintenance, and operation of works of improvement on streams or tributaries in other states which in the natural course flow through or into the state of Connecticut. (Bradley-Florida)
W73-05241

COMMENTS CONCERNING THE COASTAL ZONE OF THE UNITED STATES,
House, Washington, D.C.
J. R. Grover, Jr.
Congressional Record, Vol 118, p E9258-E9259 (daily ed.) Nov 8, 1972. 2 p.

Descriptors: *Waste water disposal, *Coastal plains, *Wetlands, *Water supply, Coasts, Coastal marshes, Management, Dredging, Financing, State governments, Local governments, Coasts, Beach erosion, Beaches, Shore protection, Grants, Government finance.
Identifiers: *Coastal waters.

Congressman James R. Grover of New York drew attention to the need for wise management of the coastal zone of the United States. Using Long Island, New York, as an example he mentioned four areas of concentration: water supply and waste water disposal, wetlands, dredging and coastal erosion and protection. Grover included a statement by a county official directed to the problems and perspectives of government officials who must make management decisions. He emphasized the need for science/technology information transfer to management to provide clear and unmistakable information needed for sound management decisions. There is also a great need for federal funds to assist state and local governments in implementing coastal zone management programs. (Nielsen-Florida)
W73-05243

THE CONCEPT INSTITUTION IN WATER MANAGEMENT USAGE,
Colorado State Univ., Fort Collins. Dept. of Political Science.
N. Wengert.
Meeting Preprint 1872, American Society of Civil Engineers National Water Resources Engineering Meeting, Jan. 29-Feb. 2, 1973, Wash., D.C., 1973 17 p. OWRR W-122 (4) 14-31-0001-3183.

Descriptors: *Water resources development, *Social aspects, *Institutional constraints, *Social values, *Management, Cities, Institutions, Social change.
Identifiers: *Metropolitan water management, Norms.

A review of the literature in water resources development and related areas discloses that the usage of the term 'institution' is imprecise. A state-of-the-art analysis of this term shows: (1) it is often not defined; (2) meanings which may be inferred are inconsistent; (3) usage sometimes is meant to exhibit awareness, without explanation, that sociological factors are involved; (4) less commonly the term exhibits awareness of institutions as the result of social processes; and (5) more commonly, the term is simply a synonym for organization. After exploration of several alternative usages in the literature it is concluded that usage as a synonym for organization is probably the least useful, and potentially the most misleading, since such usage leads to a misunderstanding of the social role, viability, or adaptability to change of water resources institutions. In this context efforts which give greater substance and meaning to the term are desirable and represent a useful contribution to a better understanding of water resources institutions. (See also W73-03253 thru W73-03255) (OWRR)
W73-05349

FLOOD PLAINS AND REGIONAL GROWTH: A SUGGESTED POLICY FOR THE SAN ANTONIO-BEXAR COUNTY AREA.
San Antonio-Bexar County Area Policy Council, Tex.
For primary bibliographic entry see Field 06F.
W73-05383

A SINGLE DEPARTMENT DEDICATED TO WATER RESOURCES MANAGEMENT,
Detroit Metro Water Dept., Mich.
G. J. Remus.
The American City, Vol. LXXXVII, No. 6, p 113-114, 134, 136, June 1972.

Descriptors: *Management, Administration, *Water supply, Sewerage, Combined sewers, *Pollution abatement, Monitoring, *Water management, Michigan.
Identifiers: Metropolitan management, *Detroit, Lake Huron.

The function and operation of the Detroit Metropolitan Water Department are described. The department provides water supply, sanitary sewerage, and storm water drainage for about four million people in Detroit and 88 neighboring communities. The department is presently completing a 400 mgd water supply plant on Lake Huron which will increase the total system capacity to 1,300 mgd. Similarly, the sewerage system has been expanding rapidly since 1966 when Detroit signed a contract with the State of Michigan for pollution control for the southeastern part of the State. Although Detroit has combined sanitary and storm sewers, it has handled the problem of overflows by installing a monitoring system and control gates to manipulate sewer flows and take advantage of relatively unused sewers. One of the primary problems in the operation of the Department is the administrative effort involved in working with more than 250 autonomous units of government. (Elfers-North Carolina)
W73-05385

DREDGING OPERATIONS AND THE ENVIRONMENT,
Army Engineer District, Galveston, Tex.
For primary bibliographic entry see Field 05G.
W73-05446

WATER POLLUTION CONTROL IN COASTAL AREAS. THE NATURE OF THE PROBLEM,
For primary bibliographic entry see Field 05G.
W73-05447

THE LAYMAN'S VIEWPOINT,
For primary bibliographic entry see Field 05G.
W73-05448

BALLAST AND WASH WATERS FROM TANKERS,
Shell International Marine Ltd., London (England).
For primary bibliographic entry see Field 05G.
W73-05459

DUMPING OF WASTE MATERIAL.

Hearings--Subcomm. on Fisheries and Wildlife Conservation--Comm. on Merchant Marine and Fisheries, United States House of Representatives, 91st Cong, 2d Sess, July 27, 28, September 30, 1970. 296 p, 1 fig, 2 dwg, 2 tab, 1 chart, 4 append.

Descriptors: *Legislation, *Waste disposal, *Fish, *Wildlife, *Oceans, Navigable waters, Jurisdiction, Permits, Licenses, Harbors, Sewers, Industrial wastes, Rivers and Harbors Act, Pollutants, Shores, Municipal water, Coasts, Aquatic life, Public health, Water quality, Legal aspects, Water pollution control, Pollution abatement, Wetlands.
Identifiers: *Congressional hearings, National Environmental Policy Act, Fish and Wildlife Coordination Act.

The purpose of these bills is to afford additional protection to fish and wildlife resources. One group of bills would amend the National Environmental Policy Act, (NEPA), by requiring revocation of all licenses that authorize the discharge of waste into New York Bight, or into any waters within a 25-mile radius of the Ambrose Lighthouse. Additionally, one section provides for a complete investigation of the cost of restoring New York Bight. The Atomic Energy Commission noted that this group of bills all relate to the disposal of waste materials into the coastal waters and submerged lands of the Outer Continental Shelf and would seriously interfere with the AEC's activities in connection with defense projects. The Department of Health, Education, and Welfare interposed several specific objections and recommended against further consideration of these bills. A second group of bills would amend the Fish and Wildlife Coordination Act to provide for the orderly regulation of dumping into the coastal waters. Several government agencies, notably the Department of Interior and the TVA, recommended deferral of action. (Bradley-Florida)
W73-05591

OPERATION OF THE NEWBURGH LOCK AND DAM, NEWBURGH, INDIANA.

Joint Hearing--Subcom. on Rivers and Harbors and the Subcomm. on Flood Control and Internal Development--Comm. on Public Works, United States House of Representatives, 92d Cong, 2d Sess, September 20, 1972. 42 p.

Descriptors: *Erosion rates, *Erosion control, *Bank erosion, *Ohio River, Rivers and Harbors Act, Federal government, Cotterdams, Dams, Hydraulic structures, Engineering studies, Bank protection, Bank stabilization, Water control, Flow control, Velocity, Damages, Erosion, Community development, Flow rates.
Identifiers: *Congressional hearings.

These hearings were held in response to complaints by local citizens who believe that streambank erosion problems at Newburgh, Indiana have been caused or, at least, assisted by the operation of the Newburgh lock and dam. The Corps of Engineers representative testified that the dam's effect of slightly increasing the local currents of the Ohio River near Newburgh was not relevant to the erosion problem. He stated that the erosion problem stems from the river banks consisting of clay overburden underlain by a stratum of silty lime sand. During periods of high water, the banks become saturated. The rapid drawdown of the water surface following the spring high water causes the silty sand to flow triggering slides of the overlying clay. This problem is general along the Ohio River in this area. Finally, the representative stated that it would cost $2 million to complete a bank protection study for the Ohio River. The Newburgh city attorney presented a case with aerial photography, hydraulic expert's analysis and local town official's testimony to convince the Subcommittee of the seriousness of the problem. The Subcommittee promised the town that it would give the problem considerable attention and do the best it could to see that corrective action is taken. (Beardsley-Florida)
W73-05592

WATERSHED PROJECTS--1972: TEKAMAH--MUD CREEK, NEBRASKA; SUGAR RIVER, NEW HAMPSHIRE; EIGHTEEN MILE CREEK, SOUTH CAROLINA.

Hearing--Subcomm. on Conservation and Watershed Development--Comm. on Public Works, U.S. House of Representatives, 92d Cong, 2d Sess, May 24, 1972. 38 p, 2 map.

Descriptors: *Erosion control, *Environmental effects, *Flood control, *Watershed management, New Hampshire, Nebraska, South Carolina, Erosion, Soil erosion, Cultivated lands, Flood damage, Flood plains, Flood plain zoning, Flood protection, Non-structural alternatives, Sediment control, Soil conservation, Sediment load, Sediment discharge.
Identifiers: *Congressional hearings.

The Subcommittee heard reports from soil conservationists connected with the watershed projects located in Nebraska, New Hampshire and South Carolina. The conservationists testified as to the economies of the area, flooding and resulting damage and the proposed effects of the projects. Each dealt with various techniques that were to be used in solving the problems of the area. Included were extensive reports from the Soil Conservation Service dealing with the nature of the project and environmental impact statements including favorable effects and unavoidable detrimental effects of the projects. Alternatives to the proposed actions were included. (Glickman-Florida)
W73-05593

NITROGEN SUPERSATURATION--COLUMBIA AND SNAKE RIVERS--STATE OF WASHINGTON.

Hearing--Comm. on Public Works Special Subcommittee--United States House of Representatives, 92d Cong, 2d Sess, May 6, 1972. 87 p, 6 fig, 4 tab, 4 chart, 43 ref.

Descriptors: *Nitrogen, *Washington, *Water pollution sources, *Dams, *Columbia River, Nitrogen compounds, Rivers, Water pollution, River systems, Wildlife conservation, Fish conservation, Legislation, Environmental control, Environmental effects, Pollutants, Water pollution control, Pollutant identification.
Identifiers: *Nitrogen supersaturation, *Congressional hearings.

Information was sought on the problem of nitrogen supersaturation and river pollution on the Columbia and Snake Rivers in Washington. The Subcommittee wanted to find out how the proper blend of progress with protection of the environment could be made. Representatives of the Department of the Army, Washington State University, the Bureau of Sport Fisheries and Wildlife, the Washington Environmental Council, Trout Unlimited, the Tri-State Steelheaders, and members of Congress spoke before the Subcommittee. Other interested parties submitted prepared statements. The problem of nitrogen supersaturation is tied to the hydroelectric dam projects on the rivers. (Reed-Florida)
W73-05594

CONSTRUCTION OF IRRIGATION DISTRIBUTION SYSTEMS.

Hearing--Subcomm. on Water and Power Resources--Comm. on Interior and Insular Affairs, U.S. Senate, 92d Cong, 2d Sess, September 18, 1972. 26 p.

Descriptors: *Legislation, *Irrigation, *Distribution systems, *Reclamation, *Irrigation systems, Irrigation, Operation and maintenance, Land reclamation, Irrigation practices, Irrigation canals, Irrigation programs, Federal government, Irrigation efficiency, Federal project policy, Water supply development.
Identifiers: *Congressional hearings.

The purpose of the hearing was to take testimony on a bill to amend an act providing for the construction of distribution systems on authorized reclamation projects by the local water users rather than by the federal government directly. The proposed bill would amend the existing act so as to make systems which include irrigation drainage works and municipal and industrial service eligible for construction under the program and to remove the requirement that the title of lands necessary for the construction of facilities be transferred to the United States and held by the United States during the term of the loan. Statements and communications to the subcommittee were made by representatives of the Department of the Interior, National Water Resources Association, Williamette Basin Project Committee, Arvin-Edison Water Storage District and the North Dakota Senate. (Reed-Florida)
W73-05595

PROPOSED CUMBERLAND ISLAND NATIONAL SEASHORE.

Hearings--Subcomm. on National Parks and Recreation--Comm. on Interior and Insular Affairs, U.S. House of Representatives, 92d Cong, 2d Sess, April 20-21, 1972. 132 p.

Descriptors: *Public lands, *Legislation, *National seashores, *Recreation, Administration, Wildlife, Hunting, Access routes, Recreation facilities, Scenery, Scenic highways, Project planning.

The purpose of the hearing was to learn as much as possible about the proposed legislation establishing the Cumberland Island National Seashore in Georgia. The Subcommittee wanted to develop as much background information as possible so that it could determine what course of action the Federal government should take. Statements were made to the Subcommittee by members of Congress and representatives of the National Audubon Society, residents of Cumberland Island and Camden County, Save America's Vital Environment, Georgia Conservancy, Sierra Club, Secretary of the Interior and the Okefenokee Rural Electric Membership Corporation. Letters were sent to the Subcommittee by other interested parties. (Reed-Florida)
W73-05596

GATEWAY NATIONAL SEASHORE, NEW YORK AND NEW JERSEY.
Congressional Record, Vol 118, p H8748-H8771 (daily ed.) September 26, 1972. 24 p.

Descriptors: *Legislation, *Recreation demand, *Public lands, *National seashores, Recreation, Recreation facilities, Beaches, Tidal marshes, Social needs, Scenery, Social aspects, Water sports, Land use, National parks, Marshes, Project planning.
Identifiers: *Staten Island.

The House of Representatives resolved itself into the Committee of the Whole to consider a bill providing for the establishment of a major recreational area for the people living within the Newark-New York metropolitan regions. The proposed national seashore would nearly double the beach front available to the public. Marshlands situated within the project area would be of interest to school children as well as ecologists. Practically all of the lands directly involved are already under public ownership. After considering and discussing the proposed legislation, the House passed the bill. (Reed-Florida)
W73-05597

PROTECTION AND IMPROVEMENT OF WATERS; ENFORCEMENT.

Me. Rev. Stat. Ann. tit. 38 secs. 362 thru 412, secs. 481 thru 422, secs. 451 thru 454 (Supp. 1971).

Descriptors: *Water quality standards, *Maine, *Legislation, *Classification, *Water pollution control, Water quality, Recreation, Water supply, Waste water disposal, Permits, Phosphorous, Mercury, Detergents, Water pollution sources, Tidal waters, Coasts, Law enforcement, Penalties (Legal), Water law, Legal review, Adjudication procedure.

Section 363, Maine Revised Statutes, Title 38, sets four standards for the classification of fresh surface waters. Section 364 sets five standards of classification for tidal waters, with the highest quality, Class 5A, suitable for all clean water uses including the harvesting of shellfish. The Act lists all inland waters, coastal streams, tidal waters and great ponds and classifies each into one of the standards. Discharges which violate the water classifications are declared to be unlawful. Pollution control is dealt with in sections 411 through 422. The act prohibits discharging directly or indirectly any refuse into inland or tidal waters. The act also regulates the boundaries of public or private solid waste disposal areas by prohibiting the establishment of such areas closer than 300 feet to any classified body of water. Additionally, the sale of high phosphorous detergents and the discharge of mercury compounds into any waters of the state are specifically banned. Also included are provisions for dredging permits and enforcement of the Act. Civil liability, criminal fines and injunctions are provided for enforcement. (Adams-Florida)
W73-05598

OIL DISCHARGE PREVENTION AND POLLUTION CONTROL.
Me. Rev. Stat. Ann. tit. 38 secs. 541 thru 557 (Supp. 1971).

Descriptors: *Legislation, *Water pollution control, *Maine, *Oil pollution, *Oil spills, Oil industry, Pollution control, Coasts, Beaches, Permits, Estuaries, Rivers, State governments, Participating funds, Seashores, Commercial fishing, Legal aspects, Penalties (Legal), Law enforcement, State jurisdiction, Oceans.
Identifiers: *Coastal waters, Absolute liability.

Finding that the transfer of oil between vessels and offshore facilities has become an increasing pollution threat to Maine's coastal waters, the state legislature has enacted legislation intended to preserve and maintain the quality of Maine's beaches, coastal waters, and estuaries. Section 543 of Title 38, Maine Revised Statutes, prohibits the discharge of oil into any coastal water or any river or stream which drains into the coastal waters of the state. In order to exercise the state's police power, section 544 creates an Environmental Improvement Commission whose duty is to grant licenses and adopt rules to regulate offshore oil activities. Section 551 sets up the Maine Coastal Protection Fund in order to provide funds necessary for anti-pollution activities such as removal of oil discharges. Since the legislature has declared that the use of the state's seacoast is to be preserved exclusively for public and private recreational facilities and certain commercial fishing purposes, section 552 imposes absolute liability upon those engaged in transferring oil and petroleum products. For violation of any rule or license issued by the Environmental Improvement Commission, a fine of up to $5,000 per day is allowed. (Adams-Florida)
W73-05599

INTERSTATE WATER POLLUTION CONTROL.

Me. Rev. Stat. Ann. tit. 38 secs. 491-A thru 496-C (Supp. 1971).

Descriptors: *Maine, *Legislation, *Water pollution control, *Interstate compacts, *Interstate commissions, Pollution abatement, Jurisdiction, Administration, Personnel management, Water quality, State governments, Water quality control, Administrative agencies, Water law, Legal aspects.

This legislation effectuates a reaffirmance of the State of Maine's cooperation in the New England Interstate Water Pollution and Control Compact. Additionally, the New England Interstate Water Pollution Control Commission is created and charged with the responsibility of developing and maintaining appropriate water quality research programs. The Commission's powers, duties, and jurisdiction are designated; moreover, specific limitations are imposed with respect to financial obligations and burdens. Organizational and operational details are set out to guide the internal workings of the Commission in developing standards for the educational and experience requirements for operating personnel. The Commission is also granted the authority to establish and maintain a water quality sampling and testing network to provide the Commission with records of water quality test results. (Mockler-Florida)
W73-05600

DESALTING AS A SOURCE OF WATER SUPPLY,
Office of Saline Water, Washington, D.C.
For primary bibliographic entry see Field 03A.
W73-05602

FEDERAL WATER RESOURCES DEVELOPMENT PROJECTS.

N.C. Gen. Stat. secs. 143-215.38 thru 143-215.43 (Supp. 1971).

Descriptors: *State governments, *North Carolina, *Legislation, *Governmental interrelations, *Local governments, Rivers, Harbors, Flood control, Water resources development, Administration, Planning, Condemnation, Leases, Project planning, Federal government.

The declared public policy of North Carolina is to encourage development of such rivers and harbors, flood control and other similar civil works projects as will accrue to the general or special benefit of any county, municipality or region within the state. Resolutions and ordinances assuring local cooperation are authorized, when the applicable Congressional act or document requires such cooperation as a condition precedent to its exercise. Items of cooperation to which localities and the state may bind themselves are enumerated, however, they are not to be interpreted as limiting but as descriptive. Necessary lands may be acquired by lease, purchase, gift or condemnation. A procedure to be followed in the acquisition of such lands is specified. For the purpose of complying with requirements of local cooperation, county and municipal governing bodies are authorized to accept funds and to use general tax funds for necessary project purposes. (Reed-Florida)
W73-05603

MAINE'S COASTAL CONVEYANCE OF OIL ACT: JURISDICTIONAL CONSIDERATIONS.
For primary bibliographic entry see Field 05G.
W73-05604

THE LITIGATION FUNCTION IN THE BASE CONTROVERSY,
Clemson Univ., S.C.
For primary bibliographic entry see Field 05G.
W73-05605

STATUS OF COASTAL ZONE LEGISLATION,
South Carolina Univ., Columbia.
C. H. Randall, Jr.
Paper presented to Seminar on Planning and Engineering in the Coastal Zone, Charleston, South Carolina. June 9, 1972. 12 p.

Descriptors: *Coasts, *Legislation, *Judicial decisions, *Coastal marshes, *Coastal plains, Legal aspects, Land use, Land management, Constitutional law, Governmental interrelations, Tidal marshes, Land development, Wetlands, Submerged Lands Act, Water Quality Act, Federal Water Pollution Control Act, Water rights, Water resources development, State governments, Zoning.
Identifiers: Tidelands, Refuse Act of 1899, National Environmental Policy Act of 1969.

There is little doubt that the Congress and the states together have adequate constitutional powers to establish a coastal zone management system. The Outer Continental Shelf Act of 1953, the Submerged Lands Act of 1953, the Federal Water Pollution Control Act, the Refuse Act of 1899 and the Environmental Policy Act of 1969 provide the framework within which a coastal zone statute will operate. These statutes were interpreted in relation to one another by the Fifth Circuit Court of Appeals in 1970 in the case of Zabel v. Tabb. Pending the formulation of a new statutory framework, the federal government, through these acts, is engaged in a holding action against further major intrusion into the tidelands. Enlightened state courts could also find ample legislative power for coastal zone legislation. Many bills aimed at coastal zone regulation and protection are currently before the Congress. The National Coastal Zone Management bills are moving swiftly toward enactment. However, there are two approaches to the problem, coastal zone and land use, and they are on a collision course. The administration prefers the land use approach. Also included are remarks on state actions in this area. (Reed-Florida)
W73-05606

OIL POLLUTION LIABILITY AND FINANCIAL RESPONSIBILITY.
Department of Transportation, Washington, D.C.

Report to the President and the Congress, 92d Cong, 1st Sess, Committee on Public Works Print, April 1971. 20 p.

Descriptors: *Oil spills, *Oil pollution, *Insurance, *Federal jurisdiction, Federal government, Legal aspects, Third party effects, Legislation, Administration, International law, Governmental interrelation, State jurisdiction, Water pollution, Water pollution sources, Oil wastes, Industrial wastes, Damages.
Identifiers: Absolute liability.

A study was conducted respecting financial responsibility requirements and limitations of liability of vessels and offshore and onshore facilities for the cost of removing discharged oil and resulting damages. After consultation with various federal agencies the Secretary of Transportation's report makes the following recommendations: limitations of liability for vessels should remain at a maximum of $14 million except for drilling vessels which should be governed by the facilities' $8 million limit; preemptive federal jurisdiction is needed to insure uniform measures; the Environmental Protection Agency should be authorized to prescribe reiuirements for proof of financial responsibility relative to the pollution potential of

the facilities; additional insurance coverage avenues for smaller facilities must be investigated; recovery should be based on a strict liability standard with compensation from a damage fund when recovery is barred from all other sources; and the current statutory third party defense for strict liability should be precluded when a contract agreement exists between the owner/operator of the polluting facility and the third party who causes the pollution. These proposals are compatible with the 1969 Brussels Civil LiabilityConvention. (Beardsley-Florida)
W73-05607

REMOVAL OF SAND AND GRAVEL.

Conn. Gen. Stat. Ann. secs. 25-10 thru 25-17 (Supp. 1971).

Descriptors: *Legislation, *Excavation, *Channeling, *Connecticut, Sands, Gravels, Environmental control, Channel improvement, Shellfish farming, Navigation, Riparian rights, Tidal waters, Permits, Regulation, Aquatic habitats, Fish, State jurisdiction, Damages, Adjudication procedure, Administrative agencies.

In order to prevent shore erosion and protect shellfish grounds, fin-fish habitats, and the rights of riparian property owners, sections 25-10 through 25-17 of the Connecticut General Statutes provide regulations for the removal of sand and gravel from lands under state tidal and coastal waters. The commissioner of environmental protection shall have the power and authority, subject to approval by the Army Corps of Engineers, to lay out channels across state lands under tidal and coastal waters for the dual purpose of providing deep water access to uplands and for the improvement of coastal and inland navigation. Pursuant to this authority, the commissioner may issue a permit for the removal of gravel or sand for any such proposed channel. As a condition precedent to the issuance of a permit, the applicant is required to pose a surety bond as a guarantee of damage payments to any person or corporation injured as a result of removal activities. A committee appointed by the superior court for Hartford County will determine the reasonable amount of damages. (Adams-Florida)
W73-05610

ESTABLISHING THE CUMBERLAND ISLAND NATIONAL SEASHORE IN THE STATE OF GEORGIA, AND FOR OTHER PURPOSES.
Senate Comm. on Interior and Insular Affairs, Senate Report No. 92-972, 92d Cong, 2d Sess, July 19, 1972. 10 p.

Descriptors: *Georgia, *National seashores, *Islands, *Legislation, Recreation, Beaches, Archaeology, History, Salt marshes, Forests, Federal government, Oceans, Swimming, Aesthetics, Access routes, Tourism, Boating, Eminent domain, Tidal marshes.
Identifiers: Coastal waters, Cumberland Island.

S.2411 seeks to establish a National Seashore off the coast of Georgia which would include both Cumberland Island and Little Cumberland Island, a total area consisting of approximately 39,500 acres, as well as provide for access routes. The two islands are comprised of extensive salt marshes, forested uplands, and notable ocean beaches. Several years ago developers began to subdivide Cumberland Island. To forestall this subdivision, the federal government initiated a program of land acquisition pending enactment of legislation to authorize a National Seashore. S.2411 would establish the Cumberland Island National Seashore by authorizing approximately $10.5 million for acquisition of remaining private property on the islands, in addition to approximately $19,010,000 to be used for historic and recreational development purposes. Since environmental protection rather than public use is the main objective for Little Cumberland Island, the bill provides that except where the lands are threatened by developments inconsistent with the Seashore, they cannot be acquired without consent of the owner for a period of two years after enactment of the bill. Within two years, however, the owners must enter into an irrevocable trust to protect the aesthetics of the area. (Adams-Florida)
W73-05611

CONSENTING TO THE KANSAS-NEBRASKA BIG BLUE RIVER COMPACT.

Senate Comm. on Interior and Insular Affairs, Senate Rep. No. 92-786, 92d Cong, 2d Sess, May 9, 1972. 4 p.

Descriptors: *Watershed management, *Interstate compacts, *River basin development, *Streamflow, *Water supply, Water pollution control, Water rights, Wildlife, Fish, Recreation, Water quality standards, Interstate rivers, Legislation, Federal government, Federal jurisdiction, Reservoir storage, Prior appropriation, Kansas, Nebraska.

The Big Blue River Basin drains an area of about 9,700 square miles, 75% of which is in Nebraska. The Big and Little Blue Rivers cross the Nebraska-Kansas state line separately to unite in the headwaters of the Tuttle Creek Reservoir, the only major storage and streamflow regulation feature on the basin. H.R. 8116 would grant Congressional consent to the Kansas-Nebraska Blue River Compact which is designed to apportion the waters of the Big Blue River Basin between Kansas and Nebraska and to reduce the pollution of these waters. The basin waters in Nebraska are allocated to Nebraska, with Nebraska guaranteeing specified streamflows into Kansas. All Kansas water rights would be junior to Nebraska water appropriations in existence on November 1, 1968. The bill provides that the states will cooperate in maintaining water quality standards, recognizing fish, wildlife, and recreational values. An interstate executive agency is created to administer the compact. It also requires that the United States be joined as a party with either signatory state involved in compact litigation. (Adams-Florida)
W73-05612

FISH DISEASE CONTROL ACT OF 1972.
For primary bibliographic entry see Field 05G.
W73-05613

STATE CITIZEN RIGHTS RESPECTING GREATWATER RESOURCE ALLOCATION: FROM ROME TO NEW JERSEY.
L. R. Jaffee.
Rutgers Law Review, Vol 25, No 4, p 571-710, Summer 1971.

Descriptors: *New Jersey, *Water rights, *Legal aspects, *Navigable waters, *Water allocation (Policy), Tidal waters, Civil law, Common law, Constitutional law, Judicial decisions, Water pollution, Legislation, Public rights, Jurisdiction, Water quality, Proprietary power, Prescriptive rights, Riparian rights, Natural flow doctrine, Eminent domain, Streams, Easements, Adverse possession.
Identifiers: Public trust doctrine.

An historical and comparative review is presented of New Jersey's water resource interests. Included in the analysis are: the public trust doctrine, state citizen interests and rights in tidal and navigable waters, a review of the law of water rights from Roman law through the common law to the present, private interference with public rights, the problem of remedies for violation of these rights traced to the present, constitutional limitations on the state's police power, and an extended discussion of the nature and development of the public water resource interest. This study begins with a definition of 'greatwater' as including tidalwaters, and navigable nontidal waters, and comprehending all waters Western law has ever deemed public. The conclusion states that the highly critical condition of New Jersey's greatwater resources reflects a history of inept legislative and administrative water resource allocation policies. The decisional law is seen as insensitive and confounded. The enactment of a constitutional amendment vesting an undivided share of the state's greatwater resource interests in each citizen as an incident of state citizenship is recommended. (Bradley-Florida)
W73-05614

STREAM CHANNELIZATION, PART I.

Hearings--Comm. on Government Operations--United States House of Representatives, 92d Cong, 1st Sess, May 3, 4, 1971. 388 p, 7 fig, 3 map, 2 illus, 51 photo, 10 dwg, 6 tab, 1 chart, 17 ref, 9 append.

Descriptors: *Channeling, *Channel improvement, *Stream improvement, *Legislation, *Environmental effects, Rivers, Streams, River regulation, River training, Water resources development, Wildlife, Recreation, Hydrologic aspects, Water quality, Federal Water Pollution Control Act, dredging, River basin development.
Identifiers: *Congressional hearings, National Environmental Policy Act of 1969, Fish and Wildlife Coordination Act.

The hearings took testimony on the effects of programs to dredge, channelize, or modify the Nation's rivers and streams conducted, or financially aided by the Corps of Engineers, the Bureau of Reclamation, the Soil Conservation Service and the Tennessee Valley Authority. The hearings were held with the hope that the accomplishments achieved through stream dredging and modification would be identified, and to ascertain what improvements are needed in the various federal programs under which these works are being carried out. The effects of these programs on the natural environment were also examined. Representatives of a dozen of the principal national conservation and wildlife organizations made their views known to the subcommittee. (See also W73-05617 and W73-05618) (Reed-Florida)
W73-05616

STREAM CHANNELIZATION, PART II.

Hearings--Comm. on Government Operations--United States House of Representatives, 92d Cong, 1st Sess, June 3, 4, 1971. 884 p, 1 fig, 1 plate, 4 map, 25 illus, 27 photo, 5 tab, 6 chart, 10 append.

Descriptors: *Channel improvement, *Administrative decisions, *Legislation, *Stream improvement, Rivers, Streams, Wildlife, Recreation, Hydrologic aspects, Water quality, Habitats, Environmental effects, Dredging, Channeling, River regulation, Federal project policy.
Identifiers: Corps of Engineers.

These hearings were held on the dredging, modification and channelization of waterways conducted or financed by federal agencies. The hearings focused on the policies, practices and procedures of these agencies. At an earlier hearing a dozen national environmental organizations had presented testimony that channelization was causing severe environmental damage. The Subcommittee was particularly interested in learning the extent to which the Corps of Engineers had given adequate environmental consideration to the comments of the Environmental Protection Agency and the Fish and Wildlife Service on its water resource projects. Statements were made to the Subcommittee

by representatives of the concerned federal agencies and members of Congress. (See also W73-05616 and W73-05618) (Reed-Florida)
W73-05617

STREAM CHANNELIZATION, PART 3.

Hearings--Comm. on Government Operations--U.S. House of Representatives, 92d Cong, 1st Sess, June 9, 10, 1971. 847 p, 24 fig, 12 plate, 17 illus, 29 photo, 6 dwg, 12 tab, 11 chart, 39 ref, 17 append.

Descriptors: *Legislation, *Stream improvement, *Channeling, *Environmental effects, Rivers, Streams, Wildlife, Recreation, Hydrologic aspects, Water quality, Habitats, Channel improvement, Dredging, River regulation, River training, River basin development.
Identifiers: *Congressional hearings.

The Subcommittee reviewed the testimony taken at two earlier hearings concerning the dredging, modification and channelization of waterways conducted or financed by the Soil Conservation Service, Corps of Engineers, Bureau of Reclamation and other federal agencies. At this hearing, the Subcommittee heard testimony from state government officials, scientists, private citizens and several organizations. Several of the witnesses favored continued channelization; others sought a temporary halt to channelization. The testimony covered both the benefits of stream channelization and the bad impacts upon the environment. (See also W73-05616 and W73-05617) (Reed-Florida)
W73-05618

POLLUTION CONTROL REGULATIONS-A PROBLEM OF FILLING GAPS,
Environmental Protection Agency, Kansas City, Mo. Region VII.
For primary bibliographic entry see Field 05G.
W73-05626

PROCEEDINGS--COMMUNITY WORKSHOP ON FLOOD INSURANCE.
Virginia Polytechnic Institute and State University, Blacksburg, Virginia. Water Resources Research Center.
For primary bibliographic entry see Field 06F.
W73-05740

A SYMPOSIUM AS CATALYST IN A PUBLIC--PRIVATE SECTOR CONFLICT,
H. Albert.
Paper presented to the South Carolina Political Science Convention, Columbia, South Carolina, April 15, 1972. 16 p, 1 tab, 8 ref. OWRR B-034-SC (3).

Descriptors: *Conferences, *Catalysts, Information exchange, State governments, Federal government, Industrial wastes.
Identifiers: *Symposium, Conflict.

In 1969 the Badische Anilin and Soda Fabrik (BASF) Corporation announced plans to build a $100 million dyestuffs plant at Victoria Bluff, South Carolina. Since BASF produces a wide range of chemical products, many people feared it would become a major polluter of South Carolina waters. Some opposition to BASF's plans emerged immediately, but it was not clearly organized and probably had little impact. BASF's announcement followed by a few days the announcement of a conservation symposium to be held near Victoria Bluff. The symposium was used as a vehicle for evaluating the probable impact of BASF's plant and for focusing public attention on the identified problems. The three strongest and most persistent proposals that came from the symposium were (1) a demand for a moratorium, (2) a demand for company posting of an indemnity bond, and (3) a demand for an objective study of the area's ecology. The symposium attracted considerable public attention, and encouraged state and national officials to respond to the private sector demands. Consequently, the symposium seemed to serve as a valuable catalyst in a public-private sector conflict. (Settle-Wisconsin)
W73-05743

OHIO CONSOLIDATED GRANT ANALYTICAL REPORT.
Water Resources Council, Washington, D.C.

Available from the National Technical Information Service as PB-209 148, $3.00 in paper copy, $0.95 in microfiche. April 1972. 107 p, 2 tab, 10 append.

Descriptors: *Water resources development, *Planning, *Grants, Financing, Coordination, Consolidation, Federal Government, State governments, *Ohio.

In an attempt to obtain funds for the development of a comprehensive state water plan, the Ohio Department of Natural Resources requested several grants from various Federal agencies whose responses were to be coordinated through the Water Resources Council. This effort at consolidating Federal grants is evaluated, and the lessons drawn from the experience are discussed. The evaluation considers the initiatives of the Department of Natural Resources, the coordinating activity of the Water Resources Council, the responses of the involved Federal agencies and their state counterparts, the role of the Office of Management and Budget, and the consolidated grant application results. The following lessons were gained from the experience: (1) there must be coordination between all involved state agencies; (2) negotiation should proceed in the field as well as in Washington and on both technical and political levels; (3) the application should identify how it will further both state and Federal agency goals; (4) Federal administrators must be convinced that the proposed program will be effectively managed and controlled; and (5) there should be both a state and a Federal coordinating agency. Materials instrumental to the evaluation are provided in ten appendices. (Settle-Wisconsin)
W73-05760

REGULATORY ASPECTS OF LIQUID WASTE INJECTION INTO SALINE AQUIFERS,
Missouri Univ., Rolla.
For primary bibliographic entry see Field 05G.
W73-05828

6F. Nonstructural Alternatives

THE REEDY RIVER: CONFRONTING THE PROBLEMS OF AN URBAN WATERSHED,
Greenville County Planning Commission, S.C.
B. W. Wyche, D. Cottingham, and L. C. Hoffman.
Report, Feb. 1972, 73 p, 7 tab, 14 ref, append.

Descriptors: Watersheds, Urban runoff, *Flood control, *Channel improvement, Flood plains, *Flood plain zoning, Low flow, Water pollution, Diversion, South Carolina.
Identifiers: Greenville (S.C.), *Reedy River, Waterfront, Army Corps of Engineers.

The study is divided into two parts, one discussing the problems and possible solutions for the Reedy River as it passes through Greenville, and the second offering a critique of a proposed Army Corps of Engineers project for the river. It covered a 21 mile reach of the river above and below the city. The river is considered to be an important physical feature of the area, but it is quite polluted, especially from urban runoff, has blighted waterfront areas, and has both low-flow and flooding problems. The Army Corps of Engineers has proposed a channelization project to alleviate the flooding problems, but it is concluded that the project would have adverse environmental effects and is not economically justifiable. Instead it is proposed that a strong program of flood plain management be enacted and that a detailed 'greenway plan' be developed. There is also a proposal for diverting water from an adjacent watershed. (Elfers-North Carolina)
W73-05382

FLOOD PLAINS AND REGIONAL GROWTH: A SUGGESTED POLICY FOR THE SAN ANTONIO-BEXAR COUNTY AREA.
San Antonio-Bexar County Area Policy Council, Tex.

Report No. 2, February 1972. 14 p, 4 fig.

Descriptors: *Flood plains, Channel improvement, Urban runoff, *Flood plain zoning, Urbanization, Flood data, Planning, *Flood plain insurance, Texas.
Identifiers: *San Antonio, *National Flood Insurance Act.

General problems related to urban development in floodplains and some policies for floodplain development and control in San Antonio are discussed. The important functions of floodplains in both a natural and an urban environment are explained, e.g. to sustain plant and animal species and to provide aesthetic and recreational opportunities. In particular, San Antonio was located primarily because of the beautiful San Antonio River basin. However, with recent channelization projects and urban encroachment in the floodplains much of the beauty has been lost and flooding from urban runoff has become a severe problem. The Area Policy Council recommends land use planning in floodplain areas, floodplain zoning, upstream run-off controls, and the use of green belts. These measures are related to the National Flood Insurance Act of 1968. The act is seen as an excellent tool for involving local governments in floodplain management. The great need for good flood data is emphasized. Without such data the planning and controls will have little meaning. (Elfers-North Carolina)
W73-05383

CHATTAHOOCHEE CORRIDOR STUDY.
Atlanta Regional Commission, Ga.
For primary bibliographic entry see Field 04C.
W73-05384

PROCEEDINGS--COMMUNITY WORKSHOP ON FLOOD INSURANCE.
Virginia Polytechnic Institute and State University, Blacksburg, Virginia. Water Resources Research Center.

Available from the National Technical Information Service as PB-203 739, $3.00 in paper copy, $0.95 in microfiche. Bulletin 44, August 1971. 188 p, 4 fig, 2 tab. OWRR A-999-VA (11).

Descriptors: Floods, *Insurance, *Conferences, Administration, Financing, Information exchange, Management, Local government, *Virginia, *Flood plain insurance, *Flood plain zoning.
Identifiers: *National Flood Insurance Act, Mortgage insurance.

Contributions to Virginia's 1971 Community Workshop on Flood Insurance are presented. The primary purpose of the conference was to provide communities with a better information base regarding technical information requirements, program functions, and community responsibilities as defined by the National Flood Insurance Act of 1968. The seventeen papers and panel discussions were divided into four categories: (1) the commu-

nities' needs and interests, (2) the flood insurance program from an administrative and financing standpoint, (3) information needs and their acquisition, and (4) community experiences. The significant issues and problem areas concerning the Flood Insurance Program that arose during the Workshop included (1) the slow community response to the Program's benefits, (2) apathetic reactions by individual homeowners and business interests to the insurance provisions (3) the generally unresponsive attitude of the insurance industry toward the Program, (4) the impact of the land management requirements and problems in implementing these requirements at the community level, and (5) responsibilities of communities to act on behalf of members of the community. The possibility that an unresponsive local government might be held legally responsible by the citzenry when flood damage occurred was also raised. (Settle-Wisconsin)
W73-05740

6G. Ecologic Impact of Water Development

WATER: THE VITAL ESSENCE,
For primary bibliographic entry see Field 05G.
W73-05220

DIVELY DRAINAGE AND LEVEE DISTRICT (DISTRICT 23), ILLINOIS (FINAL ENVIRONMENTAL IMPACT STATEMENT),
Army Engineer District, St. Louis, Mo.
For primary bibliographic entry see Field 04A.
W73-05222

CONSTRUCTION OF SABINE RIVER DIVERSION (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Economic Development Administration, Washington, D.C.
For primary bibliographic entry see Field 08A.
W73-05229

CLARKS FORK-BULLOCKS CREEK WATERSHED, SOUTH CAROLINA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 04A.
W73-05235

VERMILION HARBOR, ERIE COUNTY, OHIO (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Buffalo, N.Y.
For primary bibliographic entry see Field 08A.
W73-05609

STREAM CHANNELIZATION, PART I.
For primary bibliographic entry see Field 06E.
W73-05616

STREAM CHANNELIZATION, PART II.
For primary bibliographic entry see Field 06E.
W73-05617

STREAM CHANNELIZATION, PART 3.
For primary bibliographic entry see Field 06E.
W73-05618

AIR POLLUTION: OUR ECOLOGICAL ALARM AND BLESSING IN DISGUISE,
California Univ., Livermore. Lawrence Livermore Lab.
For primary bibliographic entry see Field 05C.
W73-05695

A SYMPOSIUM AS CATALYST IN A PUBLIC--PRIVATE SECTOR CONFLICT,
For primary bibliographic entry see Field 06E.
W73-05743

07. RESOURCES DATA

7A. Network Design

THE EFFECT OF ESTIMATION ERROR ON A GEOMETRIC MOVING AVERAGE,
Wisconsin Univ., Madison. Graduate School of Business Administration.
D. W. Wichern.
Technometrics, Vol 14, No 3, p 745-755, August 1972. 4 fig, 2 tab, 10 ref.

Descriptors: *Quality control, *Estimating equations, *Forecasting, Statistical methods.
Identifiers: *Errors, Precision, Geometric moving average.

A Bayesian approach has been used to examine the effect of estimation error on inferences about a future value generated by a particular non-stationary stochastic process for which a geometric moving average (G.M.A.) is an optimal predictor. For the example tested it was found that a point estimate of a future value given by a G.M.A. computed with a parameter estimated from the data is not particularly sensitive to estimation error. However, the variability of the forecast will be underestimated. (Little-Battelle)
W73-05508

CHARTS FOR CONFIDENCE LIMITS AND FOR FAILURE RATES,
General Electric Corporate Research and Development, Schenectady, N.Y.
W. Nelson.
Journal of Quality Technology, Vol 4, No 4, p 190-195, October 1972. 1 fig, 3 ref.

Descriptors: *Quality control, Statistical methods.
Identifiers: *Confidence limits, *Data interpretation, *Failure rates.

Simple charts for determining upper confidence limits for a product failure rate are given and their use is illustrated. They are also used to determine statistical demonstration tests. These charts are applicable when the number of failures has a Poisson or binomial distribution or when the distribution of time to failure for a product is exponential. (Little-Battelle)
W73-05577

7B. Data Acquisition

APPLICATION OF SEISMIC SHEAR WAVE STUDIES TO THE INVESTIGATION OF AQUIFERS,
Michigan State Univ., East Lansing. Dept. of Geology.
For primary bibliographic entry see Field 02F.
W73-05202

THE RENAISSANCE IN POLAROGRAPHIC AND VOLTAMMETRIC ANALYSIS,
Princeton Applied Research Corp., N.J. Chemical Instrument Corp.
For primary bibliographic entry see Field 02K.
W73-05251

TRIALS WITH AN AUTOMATED PLANKTON COUNTER,
Fisheries Research Board of Canada, Nanaimo (British Columbia). Biological Station.
J. Fulton.
Journal of the Fisheries Research Board of Canada, Vol 29, No 7, p 1075-1078, July 1972. 1 fig, 3 tab, 3 ref.

Descriptors: *Zooplankton, *Automation, *Laboratory equipment, Microscopy, Aquatic animals, Instrumentation, Size, Evaluation, Methodology.
Identifiers: *Counting, Parathemisto, Scolecithricella, Calanus pacificus, Sagitta elegans, Precision, Sample preparation.

An opto-electronic plankton counter-sizer counted samples of zooplankton in seven size classes about six times faster, with greater precision and likely greater accuracy than human sorters. Samples used in the trials were of low diversity, and dominant taxa in each of the seven size classes could be quickly identified under a low-power microscope before machine counts were made. Sample concentrations of less than 3000 organisms per liter were found to be optimal for machine counting. In samples of greater concentration, coincident passage of two or more small organisms caused a bias in favor of the larger size classes. A schematic diagram of the equipment and the method of operation are included. (Long-Battelle)
W73-05283

MACHINE FOR AUTOMATIC BACTERIOLOGICAL POUR PLATE PREPARATION,
Unilever Ltd., Sharnbrook (England). Unilever Research Lab.
A. N. Sharpe, D. R. Biggs, and R. J. Oliver.
Applied Microbiology, Vol 24, No 1, p 70-76, July 1972. 7 fig, 2 tab, 13 ref.

Descriptors: *Laboratory equipment, *Automation, Automatic control, Instrumentation.
Identifiers: *Pour plate preparation, *Petri dishes, *Culture media, *Culturing techniques, Sample preparation.

A fully automatic system for preparing poured plates for bacteriological analyses has been constructed and tested. The machine can make decimal dilutions of bacterial suspensions, dispense measured amounts into petri dishes, add molten agar, mix the dish contents, and label the dishes with sample and dilution numbers at the rate of 2,000 dishes per 8-hr day. In addition, the machine can be programmed to select different media so that plates for different types of bacteriological analysis may be made automatically from the same sample. The machine uses only the components of the media and sterile polystyrene petri dishes; requirements for all other materials, such as sterile pipettes and capped bottles of dilutents and agar, are eliminated. (Snyder-Battelle)
W73-05286

TECHNIQUE AND APPARATUS FOR RAPID AND INEXPENSIVE ENUMERATION OF BACTERIA,
Unilever Ltd., Sharnbrook (England). Unilever Research Lab.
A. N. Sharpe, E. J. Dyett, A. K. Jackson, and D. C. Kilsby.
Applied Microbiology, Vol 24, No 1, p 4-7, July 1972. 3 fig, 3 ref.

Descriptors: *Bacteria, *Analytical techniques, *Cultures, *Laboratory equipment, Sensitivity, Evaluation, Microbiology.
Identifiers: *Enumeration, Counting, Sample preparation.

A foot-operated diluter/dispenser and a projection viewer were developed for use with a rapid bacterial counting technique employing agar droplets. The diluter/dispenser consists of two pedals acting on pistons which are connected to each other and also by flexible tubing to a small handpiece which accepts either glass pipettes or polypropylene drinking straws. One piston sucks 0.5 to 2.0 ml of liquid into the pipette or straw and the other piston expels 0.1 ml of liquid. The viewer enables the user to view the enlarged droplet (ten times) on a ruled screen to facilitate dispersion of the droplet with the handpiece. Statistical evaluation of droplet and

plate counts using a paired 't' test was performed and the results were reported at the 95 percent confidence level. The equipment allows the advantages of the droplet technique to be properly realized and assists many conventional bacteriological tests which may be made at the same time. Significant cost and labor savings are made, with reductions in incubation time, incubator space, and preparative work. (Snyder-Battelle)
W73-05290

PRACTICAL TRAY-RACK FOR CULTURE DISH INCUBATION,
Mayo Clinic, Rochester, Minn.; and Mayo Foundation, Rochester, Minn.
M. R. Woodward, and C. T. Dolan.
Applied Microbiology, Vol 23, No 4, p 829-830, April 1972. 2 fig.

Descriptors: *Incubation, *Laboratory equipment, *Cultures, Storage, Microbiology, Equipment.
Identifiers: Trays.

Standard cafeteria type trays (12-1/2 by 16-1/2 inches) were modified to faciliate their use as racks for agar dishes during incubation. Four legs 1-3/4 inches long were attached to the bottom, and 0.45 caliber cartridge cases to serve as cups for legs of another tray were fastened to the top. All legs were fastened 7-1/2 inches apart. The modified trays could accommodate 12 agar dishes each, and be stacked 8 to 10 high safely. (Snyder-Battelle)
W73-05291

A RAPID METHOD FOR THE DETERMINATION OF RADIOACTIVE CESIUM ISOTOPES IN WATER,
Geological Survey, Lakewood, Colo.
For primary bibliographic entry see Field 05A.
W73-05300

BOMEX ATLAS OF SATELLITE CLOUD PHOTOGRAPHS.
National Oceanic and Atmospheric Administration, Rockville, Md. The BOMAP Office.

Available from GPO, Washington, D.C. 20402 Price $4.25 (paper cover). Report July 1971. 250 p, 2 fig, 2 tab.

Descriptors: *Cloud physics, *Atmospheric physics, *Meteorology, *Aerial photography, *Satellites (Artificial), Remote sensing, Data collections, Cloud cover, Storms, Clouds, Air masses, Air circulation, Atlantic Ocean, Oceanography, Tropical regions.
Identifiers: *Cloud photograph atlas, *BOMEX, *Barbados Island.

Aerial and satellite cloud photography was an integral part of the Barbados Oceanographic and Meteorological Experiment (BOMEX) conducted from May 3 through July 28, 1969, over the Atlantic Ocean east of the island of Barbados, which served as the base for large-scale field observations in the upper part of the ocean and the lower atmosphere. This atlas presents a selection of satellite photographs of the BOMEX area both as a part of the permanent BOMEX archive and as a research tool for scientists engaged in analysis of data collected during the experiment. Photographic views of the BOMEX area were obtained from several satellites: ESSA satellites, which provide full global coverage once a day from polar orbit; a NASA satellite ATS-III in equatorial orbit, which remains above one spot of the earth, taking and transmitting pictures at 15- to 30-min intervals on command during daylight hours; and another NASA satellite, Nimbus-III, which secured visual range photographs over the BOMEX area once a day, and infrared photographs both at night and during the day. The atlas was prepared primarily from the ATS-III photographs obtained at frequent intervals during daylight hours. (Woodard-USGS)
W73-05337

BOMEX FIELD OBSERVATIONS AND BASIC DATA INVENTORY.
National Oceanic and Atmospheric Administration, Rockville, Md. The BOMAP Office.
For primary bibliographic entry see Field 07C.
W73-05338

DETERMINING THE WATER CONTENT OF CONCRETE PANELS BY USING A MICROWAVE MOISTURE METER,
Building Research Station, Watford (England).
For primary bibliographic entry see Field 08F.
W73-05341

AN EVALUATION OF METHODS FOR DETECTING MERCURY IN SOME U.S. COALS,
Bureau of Mines, Pittsburgh, Pa. Pittsburgh Energy Research Center.
For primary bibliographic entry see Field 05A.
W73-05409

ESTUARINE IN SITU WATER QUALITY MONITORING,
Ocean Data Equipment. Ocean Data Equipment Corp., East Provivence, R.I.
For primary bibliographic entry see Field 05G.
W73-05424

ASPECT OF PETROLEUM POLLUTANT ANALYSIS,
British Petroleum Co. Ltd., London (England).
For primary bibliographic entry see Field 05A.
W73-05457

MEASUREMENT OF MOISTURE IN TYPICAL CHERNOZEM SOIL WITH AN AM-11 RESISTANCE SOIL MOISTURE METER,
For primary bibliographic entry see Field 02G.
W73-05468

A CONDUCTIVITY-TEMPERATURE-DEPTH (CTD) RECORDER AND TWELVE SEMI-CONTINUOUS PROFILES OF TEMPERATURE AND SALINITY,
Johns Hopkins Univ., Baltimore, Md. Chesapeake Bay Inst.
For primary bibliographic entry see Field 02L.
W73-05469

THE NEUTRON METHOD FOR MEASURING SOIL MOISTURE CONTENT--A REVIEW,
Hull Univ. (England). Dept. of Geography.
For primary bibliographic entry see Field 02G.
W73-05489

AUTOMATIC WATER SAMPLER MONITORS POLLUTION LOW-COST, EASY-TO-BUILD UNIT IS REAL CONTRIBUTION TO YOUR LOCAL ECOLOGY GROUP,
For primary bibliographic entry see Field 05A.
W73-05504

RELUCTIVE, INDUCTIVE, AND EDDY-CURRENT PRESSURE TRANSDUCERS.

Journal of the Measurements and Data Society of America, Vol 6, No 4, p 41-45, July-August 1972. 11 fig.

Descriptors: *Instrumentation, *Pressure measuring instruments, Equipment, Mechanical equipment, Electrical equipment, Pressure.
Identifiers: *Pressure transducers.

General operating characteristics of reluctive, inductive, and eddy-current pressure transducers are described. A tabular listing is included which shows costs, pressure ranges, model number, and manufacturers of pressure transducers. (Little-Battelle)
W73-05516

MASS FLOW MEASUREMENT.

Journal of the Measurements and Data Society of America, Vol 6, No 4, p 46-47, July-August 1972. 4 fig.

Descriptors: *Electrical equipment, *Mechanical equipment, Flow measurement, Flowmeters, Instrumentation.
Identifiers: *Mass flowmeters.

A number of mass flowmeters developed recently measure mass flow directly by using either angular momentum types, driven impeller to develop angular momentum, fluid-driven twin turbines, radial-flow angular-momentum, gyroscopic angular momentum, or temperature technique. A number of these flowmeters are listed along with the name of their manufacturer, their operating range, their principles of operation, and their cost. (Little-Battelle)
W73-05517

ON THE SORPTION OF MICROELEMENTS IN THE SEA WATER WITH ION-EXCHANGE RESIN (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Institut Okeanologii.
For primary bibliographic entry see Field 05B.
W73-05533

NEW FLOWMETER IMPROVES ACCURACY A HUNDREDFOLD.
For primary bibliographic entry see Field 02E.
W73-05534

PRINCIPAL-COMPONENT ANALYSIS APPLIED TO CHROMATOGRAPHIC DATA,
Purdue Univ., Lafayette, Ind. Dept. of Chemistry.
For primary bibliographic entry see Field 02K.
W73-05541

ULTRASONIC NEBULIZATION IN ATOMIC ABSORPTION SPECTROPHOTOMETRY,
Colorado State Univ., Fort Collins. Dept. of Chemistry.
For primary bibliographic entry see Field 05A.
W73-05542

EVALUATION OF PRECISION OF QUANTITATIVE MOLECULAR ABSORPTION SPECTROMETRIC MEASUREMENTS,
Michigan State Univ., East Lansing. Dept. of Chemistry.
J. D. Ingle, Jr., and S. R. Crouch.
Analytical Chemistry, Vol. 44, No. 8, p 1375-1386, July 1972. 2 fig, 3 tab, 15 ref.

Descriptors: *Spectrophotometry, Analytical techniques, Equations.
Identifiers: *Precision, *Molecular absorption spectroscopy, *Signal-noise ratios.

A unique signal-tonoise ratio expression is derived for quantitative molecular absorption measurements. Under certain experimental conditions this expression can be considerably simplified, and three limiting cases are discussed in which measurements are either readout limited, photocurrent shot noise limited, or source flicker limited. This treatment reveals that the usual assumption that optimum measurement precision occurs near 37 percent T can be grossly in error under certain conditions. Use of the signal-to-noise ratio expres-

sions for evaluation of measurement precision and optimization of experimental conditions is presented. Highest measurement systems are critically compared in terms of signal-to-noise ratio and other criteria for application to molecular absorption measurements. (Little-Battelle)
W73-05544

THE VOLTSENSOR,
California Electronic Mfg. Co., Inc., Pleasant Hill.
S. P. Cuff.
Journal of the Measurements and Data Society of America, Vol. 6, No. 4, p 50-56, July-August 1972. 6 fig.

Descriptors: *Automatic control, *Voltage regulations, *Electrical equipment, Equipment.
Identifiers: *Voltsensors, Voltage comparators, Alarms.

A voltsensor is used to detect a specific settable voltage level and provide either a signal or a relay closure (or both) when the specific preset point is reached. It may function as a precision DC voltage comparator, a bistable trip with adjustable trip point, a voltage sensitive relay driver, or a solid state meter relay substitute. For operation, voltsensors require a source of positive and negative voltage of the same magnitude and can accept input signals from sources such as batteries, voltage dividers, potentiometric transducers, electronic circuits, and rectified AC voltage. Using these signals it can very precisely detect specific voltage level and cause an alarm or control fucntion to occur at these points. (Little-Battelle)
W73-05546

HEATED SENSOR MASS FLOWMETER,
CGS Scientific Corp., Watertown, Mass. Datametrics Div.
H. Grant, and R. Wasserman.
Journal of the Measurements and Data Society of America, Vol. 6, No 4, p 48-49, July-August 1972. 3 fig.

Descriptors: *Flowmeters, *Instrumentation, Flow measurement, Electrical equipment.
Identifiers: *Heated sensor mass flowmeter.

The heated-sensor technique for mass flow measurement employs the principle of the hot-sensor anemometer, which instantaneously measures fluid-flow parameters by sensing the heat transfer between an electrically heated sensor and the flow medium. The flowmeters have the advantages of wide dynamic ranges, high sensitivity, high accuracy, signal outputs of 0 to 10 volts making them compatible with data processing systems, high reliability, and no need for corrections over wide ranges of temperature and pressure. (Little-Battelle)
W73-05547

THE LOGARITHMIC LOCK-IN AMPLIFIER,
Ithaco, Inc., Ithaca, N.Y.
D. M. Munroe.
Journal of the Measurements and Data Society of America, Vol 6, No 4, p 58-65, July-August 1972. 9 fig.

Descriptors: *Instrumentation, *Electrical equipment, *Measurement, Design.
Identifiers: *Signal-noise ratios, *Logarithmic lock-in amplifiers, Lock-in amplifiers, Ratiometry.

The principles of operation of linear and logarithmic lock-in amplifiers are described. The logarithmic lock-in amplifier has the advantage that its output is a logarithmic function of its input. In conjunction with an optical detector it can be used for measuring optical density, sample concentration, and for measuring signals having a wide dynamic range. The logarithmic amplifier can also be set up to operate in a dual-channel mode which can measure ratios of A/B of two separate signals A and B together with the logarithm of B. A typical application would be measurement of the ratio of light intensity as seen by two photomultipliers. The amplifier can also operate in the dual-channel mode with multiplexed signals. (Long-Battelle)
W73-05551

MOVING MAGNET METERS FOR CONTROL INSTRUMENTATION,
E. K. MacKenzie.
Measurements and Data, Vol 6, No 4, p 74-75, July/August 1972. 2 fig.

Descriptors: *Automatic control, *Instrumentation, Automation, Flow measurement, Electrical equipment.
Identifiers: *Moving magnet meter, *Process meters, Precision.

A new, weatherproof process meter, with a moving magnetic mechanism has been introduced as having or exceeding the capabilities of the Bourdon tube gage in accuracy, readability, and ruggedness. The meter also meets the requirements of electrical codes, and affords the case of calibration and field adjustment while being competitive in cost and installation. (Mackan-Battelle)
W73-05552

ION SELECTIVE ELECTRODES. PART I. A STUDY OF THE FACTORS INVOLVED IN THE CONSTRUCTION OF A HETEROGENEOUS ION SELECTIVE ELECTRODE,
Atomic Weapons Research Establishment, Aldermaston (England).
A. B. Davies.
Report No. AWRE-0-46-71, October 1971. 16 p, 2 fig, 4 tab, 16 ref.

Descriptors: Ions, Membranes, Temperature, Equations, Electrical impedance, Hydrogen ion concentration, Particle size, Resistance, Drying, Sieves, Measurement, Pollutant identification, Anodes, Cathodes, Selectivity, Design, Maintenance.
Identifiers: *Ion selective electrodes, Silver chloride, EMF, Loading (Chemical).

A method is described for the preparation of heterogeneous chloride ion selective electrodes, and the effects of specific parameters on EMF are evaluated. A variety of silver chloride electrodes were prepared to determine which parameters govern the response of these electrodes. The parameters considered were the particle size of silver chloride, loading (defined as the percentage of active material present in the matrix dry volume), the preparation of material, and the effect of nitric acid washing of the resulting membranes. Measurements were made of the EMF's of cells incorporating the electrodes, the response to a decade change in chloride concentration, and the resistances of the electrodes. The 60 - 600 microns silver chloride particle sizes were produced by grinding under dichloroethane, oven drying, and finally dry sieving. Each of the sieved fractions was mixed with the appropriate amount of a finely powdered thermoplastic powder to give loadings of 20, 40, 60, and 80 percent by volume of silver chloride. In this way the construction of the electrodes including molding of the membranes was accomplished. A 10-minute, 0.1 molar nitric acid wash was made after initial measurements, and the measurements were then repeated. The measurements include: EMF, response to decade change in chloride concentration ('A' values), effect of nitric acid washing, and electrode impedances. The 'A' values were found to be unaffected by any of the parameters evaluated, and the electrode impedances were deemed satisfactorily low at the higher loading levels. (Byrd-Battelle)
W73-05554

A METHOD FOR DETERMINING THE SURFACE AREAS OF STONES TO ENABLE QUANTITATIVE DENSITY ESTIMATES OF LITTORAL STONEDWELLING ORGANISMS TO BE MADE,
Leeds Univ. (England). Dept. of Zoology.
P. Calow.
Hydrobiologia, Vol 40, No 1, p 37-50, August 31, 1972. 4 fig, 19 ref.

Descriptors: *Methodology, Littoral, Benthic fauna, Statistical methods, Aquatic animals, Periphyton, Data collections.
Identifiers: *Species density, *Surface area, *Stones.

Due to the difficulty encountered when attempting to make quantitative density estimates of stone-dwelling littoral fauna, a detailed description of a method which allows the accurate determination of the surface areas of irregularly shaped stones is given. Since this method would be difficult to accomplish in the field, practical and statistical procedures are described for correlating surface area with some more easily measured linear, stone parameter. Stones were obtained from a 200-m shoreline with a solid limestone base of a variable depth of glacial drift and weathering debris over it. In order to obtain a truly representative sample of stones from the 'Ha Mire' shore, a random sample was made. This was achieved by dividing the shore on a map into a number of equally spaced lingitudinal and lateral divisions. The positions for stone collection were then fixed by a series of 50 random co-ordinates. Stones so collected were taken back to the laboratory where their greatest length and longest perimeters were measured (cm). Surface areas of irregularly shaped stones were determined by coating the stones with a rubber latex solution, removing the mould and calculating the weight of an even film of water which covered the surface of the mould which mirrored the stone surface. Similar work on standard bodies of known surface area revealed that .0020 (plus or minus .00012) g of water film covered 1 sq cm of mould. This factor was then used in estimating the surface areas of the stones. A relationship was found to exist between surface area and the product of the stones longest length and largest perimeter. The statistical treatment of raw data which would be obtained from the sampling described was discussed. (Holoman-Battelle)
W73-05560

REARING AND MAINTENANCE OF PLECOPTERAN NYMPHS,
Waterloo Univ. (Ontario). Dept. of Biology.
N. N. Kapoor.
Hydrobiologia, Vol 40, No 1, p 51-53, August 31, 1972. 1 fig, 1 ref.

Descriptors: *Stoneflies, *Growth chambers, *Laboratories, *Design, Growth stages, Immature growth stage, Caddisflies, Mayflies, Aquatic insects, Larval growth stage, Animal growth.
Identifiers: *Nymphs, Plecoptera, Arthropods.

A device for the rearing and maintenance of plecopterans was designed and constructed. This apparatus is satisfactory for rearing other aquatic species. A desired water temperature and current velocities can be achieved in the apparatus. A description and diagram of the apparatus are included. (Holoman-Battelle)
W73-05561

NOTE ON THE FLAMELESS ATOMIC ABSORPTION RESPONSE OF MERCURY WITHOUT ADDED REDUCING AGENT,
Cornell Univ., Ithaca, N.Y. Pesticide Residue Lab.
For primary bibliographic entry see Field 05A.
W73-05565

UTILITIES COOPERATE FOR AUTOMATIC METER READING,
Westinghouse Electric Corp., Raleigh, N.C. T-COM Systems.
R. M. Walden, Jr.
Water and Sewage Works, Vol 119, p 20-26, August 31, 1972.

Descriptors: *Data collections, *Automatic control, *Instrumentation, *Electronic equipment, Automation, Research and development, Design, Prototypes, Data storage and retrieval, Electric switches, Switchgear, Data processing, Telemetry.
Identifiers: *Minicomputers.

Westinghouse is developing an automatic meter reading system which is the prototype of an integrated, modular system employing integrated circuit designs and data processing via a mini-computer. The system, now being tested in Raleigh, N. C., is modular by design with various components being fitted together for a tailored system with a minimum of 'non-standard' apparatus. An integrated circuit encoder, which replaces the electro-mechanical encoder, solves a previous reliability problem with a non-volatile memory which enables the encoder to 'remember' the meter reading if power to the circuit fails. The encoder has readout and control circuits and parity coding so that transmission errors may be determined by the mini-computer decoder. The edge card connected, 3-encoder circuit board is designed for residential applications to read water, gas, and electric meters over the same system. (Byrd-Battelle)
W73-05574

ELECTRODES FOR MAGNETIC FLOWMETERS,
C. E. T. Technical Services Station.
S. Grey.
Water and Sewage Works, Vol 119, p 93-98, August 1972. 5 fig, 1 tab.

Descriptors: *Electrodes, *Flow measurement, Electrical equipment, Velocity, Sludge, Cleaning, Pollutant identification, Construction, Maintenance, Flow, Flowmeters.
Identifiers: *Magnetic flowmeters.

The two types of electrodes produced for electromagnetic flowmeters are 'standard', the model most commonly used, and 'bullet nose', which are designed with self-cleaning capabilities. Selection of material for construction of the electrodes is based primarily on their resistance to corrosion and abrasion, depending upon the application. A standard type should be set flush with the liner of a flow tube, and a bullet nose type should project approximately one-fourth inch into the liner's inside diameter. These two types of electrodes are removable and easily inspected, cleaned, and replaced. The following methods of cleaning electrodes are offered by different manufactures: internal scraper, heating, ultrasonics, and hot water flushing methods. Precautions should be taken to keep a magnetic flow system from malfunctioning due to action of the raw sludge flow. The principle and purpose of the electrodes are discussed. (Byrd-Battelle)
W73-05575

INVESTIGATION OF LAKE WATER QUALITY IN EASTERN SOUTH DAKOTA WITH REMOTE SENSING TECHNIQUES,
South Dakota State Univ., Brookings. Remote Sensing Inst.
For primary bibliographic entry see Field 05A.
W73-05580

A SIMPLIFIED METHOD TO RELATE AVERAGE HEAD TO TOTAL FLOW,
Oakland County Dept. of Public Works, Pontiac, Mich.
J. B. Shah.
Water and Sewage Works, Vol 119, No 8, p R-69/R-71, August 1972. 5 fig.

Descriptors: *Mathematical studies, *Flow measurement, *Flow rates, Fluctuations, Pollution abatement, Michigan.
Identifiers: *Heat.

A curve was developed, relating average head across the weir (in feet) to the true total flow (in cf) per week, after converting several head (in feet) charts into discharge (in cfs) charts, from second to second. The curve was found to have the equation Q±17.58 x 105 H2.51, parabolic in nature. It simplified calculation of true totalized flow per week from planimetered average head. (Smith-Texas)
W73-05620

ANALYSIS AND INTERPRETATION OF AIR-BORNE MULTIFREQUENCY SIDE-LOOKING RADAR SEA ICE IMAGERY,
Naval Oceanographic Office, Washington, D.C. Polar Oceanography Div.
R. D. Ketchum, Jr., and S. G. Tooma, Jr.
Journal of Geophysical Research, Vol 78, No 3, p 520-538, January 20, 1973. 12 fig, 1 tab, 4 ref.

Descriptors: *Radar, *Sea ice, Mapping, *Surveys, *Remote sensing, Data collections, Ice, Icebergs, Instrumentation, *Arctic, Alaska.

An airborne side-looking radar experiment over the sea ice fields north of Alaska used the four-frequency radar system of the Naval Research Laboratory. The shorter-wavelength X band radar has the greatest potential for sea ice study when more definitive information is required for mapping, distributions of stages of ice development, and fracture pattern analysis. Pressure ridge patterns can sometimes be identified when they are present on a low-backscatter background. The L band radar has potential value for mapping the areal distribution for surface topography. This wavelength does not receive discriminative backscatter from various ice types but sees only the more prominent topographic features, such as ridges and hummocks. The P band does not appear to have any characteristics that would make it valuable for sea ice mapping. Only the most prominent features, such as large fractures and floes, were imaged by this radar. (Knapp-USGS)
W73-05678

MEASUREMENTS OF SHEAR DEFORMATION OF A NATURAL ICEFIELD WITH OPTICAL THEODOLITES (REZUL'TATY IZMERENIYA DEFORMATSII SDVIGA YESTESTVENNOGO LEDYANOGO POLYA OPTICHESKIMI TEODOLITAMI),
Arkticheskii i Antarkticheskii Nauchno-Issledovatelskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 02C.
W73-05716

OBSERVATIONS OF ICE MOTION WITH OPTICAL THEODOLITES ON THE SEVERNYY POLYUS-17 DRIFTING STATION (O NABLYUDENIYAKH ZA PODVIZHKAMI L'DA OPTICHESKIMI TEODOLITAMI NA DREYFUYUSHCHEY STANTSII 'SEVERNYY POLYUS-17'),
Arkticheskii i Antarkticheskii Nauchno-Issledovatelskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 02C.
W73-05717

A SUCTION DREDGE FOR COLLECTING BIOMPHALARIA AND OTHER MOLLUSCS FROM DEEP WATER,
Ministry of Health, Kampala (Uganda). Vector Control Div.
M. A. Prentice, and G. E. Ealden.
Bull W H O. Vol 45, No 2, p 257-259. 1971. Illus.
Identifiers: *Biomphalaria, Collection, Dragonfly, Dredges, *Mollusks, Nymphs, Pumps, *Suction dredge.

The apparatus consists of a petrol-driven pump mounted on a small boat powered by an outboard motor; material is pumped off the lake bottom through a trailing pipe and discharged into a wire-mesh collecting basket. The pump is of the diaphragm type and has only one simple flap valve on the intake side. The diaphragm is free at the periphery and acts as its own delivery valve. The generous working clearances of the pump and the flexible diaphragm result in minimal damage to live material (dragonfly nymphs, for example, are delivered unharmed) and small stones up to 3/4 in. (18 mm) diameter pass without damage to the pump. The intermittent suction, characteristic of this type of pump, helps to prevent the inlet being blocked by detritus. Centrifugal type pumps are unsuitable because of their small working clearances.--Copyright 1972, Biological Abstracts, Inc.
W73-05719

EVAPOTRANSPIRATION OF IRRIGATED HIGH MOUNTAIN MEADOWS IN SOUTHERN WYOMING,
Wyoming Univ., Laramie. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02D.
W73-05765

A METHOD FOR MEASURING SOIL EROSION AND DEPOSITION WITH BETA PARTICLE ATTENUATION,
Colorado State Univ., Fort Collins. Dept of Radiology and Radiation Biology.
For primary bibliographic entry see Field 02J.
W73-05782

THE APPLICATION OF HYDROACOUSTIC METHODS FOR AQUATIC BIOMASS MEASUREMENTS: A NOTE ON ECHO ENVELOPE SAMPLING AND INTEGRATION,
Massachusetts Inst. of Tech., Cambridge.
J. B. Lozow, and J. B. Suomala, Jr.
Available from the National Technical Information Service as COM-72-10664, $3.00 in paper copy, $0.95 in microfiche. Sea Grant Project Office Report MITSG 72-8, March 1, 1972. 92 p, 23 fig, 4 ref, 6 append. NOAA Contract 14-17-007-1125.

Descriptors: *Biomass, *Aquatic habitats, *Fish populations, *Sonar, Analytical techniques, Acoustics, Sounding, Measurements, Data collections, Mathematical studies, Equations, Correlation analysis.
Identifiers: *Aquatic biomass measurements, Echo signals.

A detailed analysis of basic fish abundance estimation techniques and their respective errors is presented. Echo sampling and integration schemes approach unbiased population estimates if the following details are known: the average target strength of the aggregation, the approximate 'shape' or geometry of the fish aggregation, and the transducer directivity function, source level, valtage response, etc. Unbiased estimates of dense populations demand a prior knowledge of the geometry and distribution of the randomly assembled targets with respect to the transducer's effective volume coverage. Two typical geometries are examined: thick layer of infinite expanse and thin layer of infinite expanse. The effect of the random phase components on the variance of the population estimate is demonstrated, and the autocorrelation of the echo intensity is given. (Woodard-USGS)
W73-05788

WATER VAPOR: STRATOSPHERIC INJECTION BY THUNDERSTORMS,
National Oceanic and Atmospheric Administration, Boulder, Colo. Environmental Research Labs.
For primary bibliographic entry see Field 02B.
W73-05799

CORRELATION TECHNIQUES AND MEASUREMENTS OF WAVE-HEIGHT STATISTICS,
Stanford Research Inst., Menlo Park, Calif.
H. Guthart, W. C. Taylor, K. A. Graf, and D. G. Douglas.
Available at NTIS, Springfield, Va 22151, NASA CR-2153, Price $3.00 printed copy; 95 cents microfiche. National Aeronautics and Space Administration Contractor Report NASA CR-2153, December 1972. 46 p, 28 fig, 17 ref.

Descriptors: *Waves (Water), *Currents (Water), *Model studies, Measurement, Height, Analytical techniques, Wind velocity, Mathematical studies, Correlation analysis, Statistical methods.
Identifiers: *Wave-height statistics.

Statistical measurements of wave-height fluctuations have been made in a wind-wave tank. The power spectral density function of temporal wave-height fluctuations evidenced second-harmonic components and an f to the minus 5 power-law decay beyond the second harmonic. The observations of second-harmonic effects agreed very well with a theoretical prediction. From the wave statistics, surface drift currents were inferred and compared to experimental measurements with satisfactory agreement. Measurements were made of the two-dimensional correlation coefficient at 15 deg increments in angle with respect to the wind vector. An estimate of the two-dimensional spatial power spectral density function was also made. (Woodard-USGS)
W73-05804

INSTRUMENTAL SURVEILLANCE OF WATER QUALITY, A REVIEW OF THE ROLE OF ANALYTICAL INSTRUMENTATION,
Beckman Instruments, Inc., Fullerton, Calif.
For primary bibliographic entry see Field 05A.
W73-05824

7C. Evaluation, Processing and Publication

TRITIUM SURVEILLANCE SYSTEM, JANUARY-MARCH 1972.
Environmental Protection Agency, Washington, D.C. Office of Radiation Programs.
For primary bibliographic entry see Field 05B.
W73-05231

RECORDS OF SELECTED WATER WELLS AND TEST HOLES IN THE OKLAHOMA PANHANDLE,
Geological Survey, Oklahoma City, Okla.
G. L. Hoffman, and D. L. Hart, Jr.
Geological Survey open-file report, 1973. 59 p, 5 fig, 2 tab.

Descriptors: *Groundwater resources, *Oklahoma, *Water wells, *Well data, *Aquifer characteristics, Water yield, Water levels, Specific capacity, Water utilization, Geology, Hydrologic data, Basic data collections.
Identifiers: *Oklahoma Panhandle.

Because of increased use of groundwater in the Oklahoma Panhandle, the U.S. Geological Survey, in cooperation with the Oklahoma Water Resources Board, began a detailed study in 1966 of the area's groundwater resources. Tabulated data include well depth, well yield, and water levels for approximately 1,500 water wells and test holes. This information should be useful to those concerned with development of groundwater in the Panhandle. The location of all known irrigation wells drilled before 1972 and selected domestic and stock wells in Beaver, Cimmarron, and Texas Counties are shown. The generalized section of geologic formations briefly describes the character and water supply available from each unit. (Woodard-USGS)
W73-05294

RECORDS OF HYDROLOGIC DATA, WALTON COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla.
C. A. Pascale, C. F. Essig, Jr., and R. R. Herring.
Florida Bureau of Geology Information Circular No 78, 1972. 103 p, 5 fig, 9 tab, 8 ref.

Descriptors: *Hydrologic data, *Surface waters, *Groundwater, *Water quality, *Florida, Streamflow, Discharge measurement, Rainfall-runoff relationships, Flow rates, Groundwater resources, Water wells, Water yield, Water-level fluctuations, Well data, Drillers logs, Aquifer characteristics, Chemical analysis, Basic data collections.
Identifiers: *Walton County (Fla).

Hydrologic data for Walton County, Florida, include rainfall amounts, discharge, chemical analyses, temperatures, and specific conductance records collected at 25 surface-water sites, and chemical analyses of groundwater, well descriptions, and records of groundwater levels collected at 164 groundwater sites. Also included are 35 logs of the sedimentary rocks penetrated in the drilling of wells and test borings ranging in depth from 147 to 625 feet. The well-numbering system is that of the Water Resources Division of the U.S. Geological Survey. It is based on the location of wells within a 1-second grid of parallels of latitude and meridians of longitude. Hydrologic and geologic information are presented in tables which group the data according to type. Maps of the area show the locations of data-collection stations. (Woodard-USGS)
W73-05295

STARTING CONDITIONS FOR AQUIFER SIMULATIONS,
Birmingham Univ. (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 02F.
W73-05307

INDEX OF WATER-QUALITY STATIONS, WATER YEAR 1972.
Geological Survey, Washington, D.C. Water Resources Div.

Geological Survey Report, 1972. 501 p, 1 fig, 7 tab.

Descriptors: *Water quality, *Surface waters, *Indexing, *Data collections, *United States, Sampling, Sites, Stations, Water analysis, Chemical analysis, Water chemistry, Water properties, Streams, Rivers, Lakes, Reservoirs, Sediment yield, Water temperature, Analytical techniques, Projects, Administrative agencies, Documentation.
Identifiers: U.S. Territories.

The water-quality stations listed in this index are maintained by the U.S. Geological Survey in cooperation with other agencies for the collection of basic data on the chemical, biological, microbiological, and physical characteristics of streams, lakes, and reservoirs in the United States and its territories. The stations are listed in alphabetical order by State in two sections: (1) active stations and (2) stations that were discontinued during the previous water year. Information for each station consists of: Identification number, latitude and longitude, station name, drainage area, State, county, date established, type of data collected (chemical, sediment, temperature), available discharge records, frequency of sampling, type of project, source of operating funds, number of years the station has been in operation, and the constituents determined by analysis in the laboratory, in the field, or by digital monitor. This information is also summarized by State in tables. (Woodard-USGS)
W73-05336

BOMEX FIELD OBSERVATIONS AND BASIC DATA INVENTORY.
National Oceanic and Atmospheric Administration, Rockville, Md. The BOMAP Office.

Available from GPO, Washington, D.C. 20402 Price $4.25 (paper cover). Report March 1971. 428 p, 88 fig, 42 tab.

Descriptors: *Atmospheric physics, *Oceanography, *Heat transfer, *Tropical regions, *Meteorology, Data collections, Instrumentation, Ships, Aircraft, Remote sensing, Satellites (Artificial), Islands, Atlantic Ocean, Cloud physics, Aerial photography, Radar, Precipitation (Atmospheric), Sampling, Winds, Temperature, Radiation.
Identifiers: *Meteorological data inventory, *BOMEX, *Barbados Island.

The principal objective of the Barbados Oceanographic and Meteorological Experiment (BOMEX) was to measure the rate of exchange of the 'properties' heat, water substance, and momentum between the tropical ocean and the atmosphere. As an experimental prototype of the basic grid element of a global observation system, an area 500 km x 500 km east of Barbados was chosen for field operations, during which data were gathered by ships, aircraft, and buoys, supplemented by satellite data and land-based observations on the island of Barbados. The field operations were divided into four observation periods of 13 to 18 days each to support the two major investigations: the air-sea interaction investigation, conducted during BOMEX Period I, May 3 to May 15, Period II, May 24 to June 10, and Period III, June 19 to July 2, 1969; and the investigation of tropical convective systems, conducted during Period IV, July 11 to July 28, 1969. The methods of collecting data and an inventory of the data collected are presented. (Woodard-USGS)
W73-05338

A PHYSIOGRAPHIC SURVEY OF THE PONDEROSA PINE TYPE ON THE SALT-VERDE RIVER BASIN,
Arizona Agricultural Experiment Station, Tucson.
For primary bibliographic entry see Field 04A.
W73-05378

COST EFFECTIVENESS METHODOLOGY FOR ENVIRONMENTAL MONITORING SYSTEMS,
Center for the Environment and Man, Inc., Hartford, Conn.
For primary bibliographic entry see Field 05G.
W73-05423

NUMERICAL MODEL FOR ESTUARINE WATER QUALITY PREDICTION,
Massachusetts Inst. of Tech., Cambridge.
For primary bibliographic entry see Field 05G.
W73-05425

WATER FROM THE PRINCIPAL ARTESIAN AQUIFER IN COASTAL GEORGIA,
Geological Survey, Atlanta, Ga.
R. E. Krause, and D. O. Gregg.
Georgia Department of Natural Resources Water Resources Survey of Georgia Hydrologic Atlas 1, 1972. 1 sheet, 5 fig, 1 tab, 24 ref.

Descriptors: *Groundwater resources, *Hydrogeology, *Water quality, *Georgia, *Coasts, Water wells, Aquifer characteristics, Withdrawal, Pumping, Water yield, Water level fluctuations, Hydrologic data, Hydrographs, Maps, Chemical analysis, Water utilization, Saline water intrusion, Planning, Water resources development, Artesian aquifers.
Identifiers: *Coastal Georgia.

This hydrologic atlas reviews the history of, and makes some predictions on the effect of, the use of water from the principal artesian aquifer in coastal Georgia. The aquifer is limestone of middle Eocene to Oligocene age, is more than 500 feet thick, and lies from 150 to 600 feet below land surface. The water is generally hard to very hard, somewhat alkaline, of the calcium bicarbonate type, and has moderately high dissolved solids. The water is generally not treated except for aeration and chlorination when it is used for municipal supply, or when very high quality water is needed for certain industrial use. Heavy groundwater pumpage from the aquifer in Savannah and Brunswick has created potential for salt-water encroachment problems in those two areas. In the Savannah area, sea water enters the aquifer from the sounds of South Carolina where overburden is thin or lacking. It then moves down the hydraulic gradient toward the cone of depression caused by the pumpage at Savannah. (Woodard-USGS)
W73-05472

MONTE CARLO APPROACH TO SEEPAGE IN JOINTED ROCK,
Notre Dame Univ., Ind. Dept. of Civil Engineering.
For primary bibliographic entry see Field 08E.
W73-05478

SEA-WATER INTRUSION IN THE UPPER PART OF THE FLORIDAN AQUIFER IN COASTAL PASCO COUNTY, FLORIDA, 1969,
Geological Survey, Tallahassee, Fla.
R. C. Reichenbaugh.
Florida Bureau of Geology Map Series No 47, 1972. 1 sheet, 9 fig, 8 ref.

Descriptors: *Saline water intrusion, *Aquifers, *Florida, *Sea water, *Groundwater movement, Hydrogeology, Coasts, Aquifer characteristics, Water wells, Water utilization, Pumping, Groundwater recharge, Water quality, Chemical analysis, Salinity, Saline water-freshwater interfaces, Hydrologic data, Maps.
Identifiers: *Pasco County (Fla), Atlas.

This one-sheet atlas describes sea-water intrusion in coastal Pasco County, Florida. The salt water-fresh water interface (as defined by a chloride concentration of 250 mg/liter at 100 feet below mean sea level) closely parallels the gulf coast 1 to 2 miles inland. Landward from the interface, groundwater containing chloride in concentrations greater than 250 mg/liter lies deeper than 100 feet below mean sea level, and the elevation of the potentiometric surface exceeds 2.5 feet above mean sea level. Salt water encroaches upon the fresh-water supply in the upper part of the Floridan aquifer in coastal Pasco County by three principal avenues: (1) laterally through the permeable limestone of the aquifer, where it is in contact with sea water offshore, (2) by way of the tidal streams and canals in which salt water is free to move upstream and inland, from which to intrude the aquifer, and (3) the upward movement of salt water through the aquifer as a result of the lowering of the fresh-water head in the coastal part of the aquifer. Sea-water intrusion would be countered by placing salt-water control structures on tidal streams and canals and by maintaining high fresh-water head in the aquifer. (Woodard-USGS)
W73-05485

A HYDROLOGIC DESCRIPTION OF LAKE THONOTOSASSA NEAR TAMPA, FLORIDA,
Geological Survey, Tallahassee, Fla.
R. C. Reichenbaugh, and J. D. Hunn.
Florida Bureau of Geology Map Series No 48, 1972. 1 sheet, 3 fig, 1 map, 2 tab, 12 ref.

Descriptors: *Hydrologic data, *Lakes, *Florida, *Water quality, *Watershed management, Chemical analysis, Limnology, Water analysis, Water chemistry, Water pollution sources, Municipal wastes, Industrial wastes, Dissolved oxygen, Nutrients, Ecology, Fishkill, Water level fluctuations, Inflow, Planning, Engineering structures, Hydrographs, Maps.
Identifiers: *Lake Thonotosassa (Fla), *Hillsborough County (Fla).

This one-sheet atlas describes the hydrology of Lake Thonotosassa, a 1.29-square-mile (824 acres) lake in eastern Hillsborough County Florida. This information will be useful in assessing the present character of the lake and predicting the effects of water management such as the Four River Basins project proposed by the Army Corps of Engineers. This project would incorporate Lake Thonotosassa and a part of Baker Creek within a plan to reduce flooding in the lower Hillsborough River. Inflow to the lake is primarily rural-area runoff combined with municipal and industrial waste water. The lake bottom is uniform and is covered with muck in deeper parts of the lake. Wells near the lake show that the water level in the shallow sand aquifer and the level of the lake are similar, and both are at a higher elevation than the potentiometric surface in the confined limestone aquifer. The lake level has varied little in recent years. With improved waste treatment in April 1970, the oxygen-demanding waste load reaching the lake and the nutrient load has been reduced. Because the lake is presently enriched and the nutrient input continues, algal blooms in the lake are likely to continue to cause periods of low DO content and fish distress or death. (Woodard-USGS)
W73-05486

FINGERPRINTING OIL SLICKS.
For primary bibliographic entry see Field 05A.
W73-05573

REGRESSION ANALYSIS AS A METHOD OF PROGNOSIS, (IN RUSSIAN),
A. M. Aksyutina, and K. G. Yankovskaya.
Tr Bses Nauchno-Issled Inst Morsk Rybn Khoz Okeanogr. 79: P 78-82, 1971. English summary.
Identifiers: Fishing industry, *Prognosis, *Regression analysis.

Prognosis of the source of raw materials in the fishing industry by regression analysis consists of isolation of m general factors which determine the condition of the reserves, conduction of n independent observations of them and their corresponding reserves (n>m) and construction of a multiple regression equation on empirical data as an approximate prognostic function. The prognosis is made by computing the function of the reserves using concrete values for its determining factors.--Copyright 1972, Biological Abstracts, Inc.
W73-05584

A COMPUTER PROGRAM FOR THE SOLUTION OF DOUBLE SAMPLING PLANS,
University of Southwestern Louisiana, Lafayette.
B. Chow, P. C. Dickinson, and H. Hughes.
Journal of Quality Technology, Vol 4, No 4, p 205-209, October 1972. 2 ref.

Descriptors: *Computer programs, *Quality control, Sampling, Statistical methods.
Identifiers: *Double sample procedures, Acceptance testing.

A computer program is described which provides solutions to double sampling plans when given an acceptable quality level and a lot tolerance percent defective. Output from the program includes: (1) sample sizes, (2) acceptance and rejection numbers, and (3) average outgoing quality limit. The user may also request values for: (1) proportion defective, (2) probability of acceptance, (3) average total inspection, (4) average outgoing quality, and (5) average sample numbers. The data may be obtained for four sampling plans which minimize either the consumer's or the producer's risk. (Little-Battelle)
W73-05589

ON APPROXIMATIONS TO THE T-DISTRIBUTION,
Rochester Univ., N.Y.
E. J. Dudewicz, and S. R. Dalal.
Journal of Quality Technology, Vol 4, No 4, p 196-198, October 1972. 1 append.

Descriptors: *Computer programs, *Quality control, Statistical methods, Probability.
Identifiers: *Student's t-distribution, Significance.

The distribution function of the Student's t-distribution is often needed in applied statistics, e.g., in computing the significance probability (p-value) of the usual test when comparing two means, and in computing tables needed for statistical procedures which do not assume known variances. It has been customary to either use a table-lookup or to calculate values via an infinite series or via an approximation which performs poorly for a small number of degrees of freedom. An algorithm for evaluation of this distribution function can be implemented in a fast, accurate and short computer program. (Little-Battelle)
W73-05590

CONTROL SYSTEMS FOR WASTEWATER TREATMENT PLANTS,
Clemson Univ., S.C.
For primary bibliographic entry see Field 05D.
W73-05652

COMPUTER CONTROL-ARAKAWA TREATMENT PLANT,
Association of Ara-River Basin-Wide Sewage Works, Tokyo (Japan).
For primary bibliographic entry see Field 05D.
W73-05653

COOPERATIVE GULF OF MEXICO ESTUARINE INVENTORY AND STUDY, LOUISIANA: PHASE III, SEDIMENTOLOGY,
Louisiana Wildlife and Fisheries Commission, New Orleans.
For primary bibliographic entry see Field 02L.
W73-05673

WATER-QUALITY DATA FOR THE FLAMING GORGE RESERVOIR AREA, UTAH AND WYOMING, 1969-72,
Geological Survey, Salt Lake City, Utah.
E. L. Bolke, and K. M. Waddell.
Geological Survey open-file report (duplicated as Utah Basic-Data Release No 24), 1972. 50 p, 1 fig, 6 tab, 7 ref.

Descriptors: *Water quality, *Chemical analysis, *Reservoirs, *Utah, Basic data collections, Sampling, Streams, Inflow, Water analysis, Water chemistry, Sediments, Inorganic compounds, Chlorophyll, Water temperature, Streamflow, Flow rates, Light penetration, Secchi disks, *Wyoming.
Identifiers: *Flaming Gorge Reservoir (Utah and Wyo).

Samples for chemical quality analysis were collected from Flaming Gorge Reservoir in Utah and

Wyoming between October 1970 and September 1972 at 17 sites. Chemical and physical data were measured in situ at 34 sites. The chemical-quality data for the 1969-71 water years for streams flowing into and out of the reservoir also are tabulated. The sampling stations for these streams are Green River near Green River, Wyo., Blacks Fork near Little America, Wyo., Henrys Fork at Linwood, Utah, and Green River near Greendale, Utah. In addition to the Geological Survey station identification number, each stream site has been assigned a letter to identify its position on a map. (Woodard-USGS)
W73-05693

HYDROLOGICAL STATISTICS,
Ministry of Works, Wellington (New Zealand). Water and Soil Div.
F. Scarf.
New Zealand Ministry of Works Handbook of Hydrological Procedures: Procedure No 25, 1971. 33 p, 2 fig, 4 tab, 6 ref.

Descriptors: *Hydrologic properties, *Hydrologic data, *Statistical methods, *Analytical techniques, Regression analysis, Correlation analysis, Time series analysis, Statistical models, Equations, Mathematical studies, Computer programs.
Identifiers: *New Zealand, Methods handbook.

Statistical procedures used frequently in hydrological work and analyses are discussed. The major objective is to enable hydrological research workers to use statistics with a minimum of background statistical knowledge. Each procedure begins with an outline of each calculation using general terms, followed by a worked example. Some formulae differ from the form usually shown in statistical textbooks. The formulae are streamlined for machine calculations. Statistical theory has, in general, been purposely neglected in an attempt to make the procedures useful. However certain essential notation is outlined. An example for one of the statistical procedures includes monthly rainfall values recorded for two precipitation stations, A and B, in adjacent catchments. After one year of records, the possibility of closing station A is investigated by correlating station A against station B to test if rainfall records for station A can be estimated from records obtained at station B. (Woodard-USGS)
W73-05699

INVESTIGATION OF ICE CONDITIONS IN ARCTIC SEAS AND METHODS OF FORECASTING AND COMPUTATION (ISSLEDOVANIYE LEDOVOGO REZHIMA ARKTICHESKIKH MOREY I METODY PROGNOZOV I RASCHETOV).
Arkticheskii i Antarkticheskii Nauchno-Issledovatelskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 02C.
W73-05702

TESTING A NUMERICAL MODEL OF SPRING-SUMMER REDISTRIBUTION OF SEA ICE (ISPYTANIYE CHISLENNOY MODELI VESENNE-LETNEGO PERERASPREDELENIYA MORSKOGO L'DA),
Arkticheskii i Antarkticheskii Nauchno-Issledovatelskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 02C.
W73-05704

STATISTICAL CHARACTERISTICS OF SOME ICE COVER PARAMETERS IN THE ARCTIC (STATISTICHESKIYE KHARAKTERISTIKI NEKOTORYKH PARAMETROV LEDYANOGO POKROVA V ARKTIKE),
Arkticheskii i Antarkticheskii Nauchno-Issledovatelskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 02C.
W73-05713

APPLICATION OF COMPUTERS TO DETERMINATION OF AGE CHARACTERISTICS OF ARCTIC ICE (ISPOL'ZOVANIYE EVM DLYA OPREDELENIYA VOZRASTNYKH KHARAKTERISTIK ARKTICHESKIKH L'DOV),
Arkticheskii i Antarkticheskii Nauchno-Issledovatelskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 02C.
W73-05718

SYSTEMS APPROACH TO DESIGN OF SPRINKLER IRRIGATION,
Hawaii Univ., Honolulu.
For primary bibliographic entry see Field 03F.
W73-05722

A PROCESS MODEL FOR COMPUTER CONTROL OF CROP GROWTH,
Hawaii Univ., Honolulu. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 03F.
W73-05731

SALT RIVER PROJECT'S COMPUTERIZED IRRIGATION.
For primary bibliographic entry see Field 03F.
W73-05733

DYNAMIC SIMULATION OF PLANT GROWTH--PART I. DEVELOPMENT OF A MODEL,
Ohio Agricultural Research and Development Center, Wooster.
For primary bibliographic entry see Field 02I.
W73-05734

DROUGHTS AS EXTREME DISTRIBUTIONS FROM A POINT RAINFALL PROCESS,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 02A.
W73-05777

MAP SHOWING LENGTH OF FREEZE-FREE SEASON IN THE SALINA QUADRANGLE, UTAH,
Geological Survey, Washington, D.C.
H. R. Covington.
Available for sale by USGS, Washington, D C 20242, Price - 75 cents. Geological Survey Miscellaneous Geologic Investigations Maps, Map I-591-E, 1972. 1 sheet, 1 map.

Descriptors: *Air temperature, *Ice, *Thawing, *Utah, Meteorology, Maps, Data collections, Seasonal, Fluctuations, Weather data.
Identifiers: *Salina quadrangle (Utah), *Freeze-free season.

Contours and colors on a map of Salina quadrangle, Utah, scale 1:250,000, show the average number of days between the last spring freeze (temperature 32 F or below) and the first autumn freeze. In general, long freeze-free periods occur at low elevations, and short freeze-free periods occur at high elevations. But some valley floors have shorter freeze-free seasons than the flanking foothills because air cooled at high elevations flows downward and is trapped in the valleys. This temperature pattern occurs in the western part of the quadrangle in Rabbit Valley, Grass Valley, and the Sevier River valley near Salina. (Woodard-USGS)
W73-05801

MAP SHOWING GROUND-WATER POTENTIAL IN THE ASPEN QUADRANGLE, PITKIN COUNTY, COLORADO,
Geological Survey, Washington, D.C.
B. Bryant.
Available for sale by USGS, Washington, D C 20242 Price - 75 cents. Geological Survey Miscellaneous Geologic Investigations Maps, Map I-785-B, 1972. 1 sheet, 1 map, 2 ref.

Descriptors: *Groundwater resources, *Water wells, *Aquifer characteristics, *Colorado, Withdrawal, Water utilization, Mining, Hydrologic data, Groundwater movement, Water types.
Identifiers: *Pitkin County (Colo), Aspen quadrangel (Colo).

This map, scale 1:24,000, shows groundwater resources for the Aspen quadrangel, Pitkin County, Colorado. About 80 are in alluvium of the Roaring Fork River valley, 15 in alluvium of Castle, Maroon, and Hunter Creeks, and 5 in bedrock. Yields range from 3 to 300 gpm, most in the 10- to 30-gpm range. Most of the wells are in aquifers composed of glacial moraine and outwash, alluvial fans, and alluvium. Well logs suggest that permeable water-bearing gravels occur widely in the alluvial and glacial fill of the Roaring Fork River valley regardless of the deposits found on the surface. Because only five wells penetrate bedrock below the fill, the thickness and the configuration of the bottom of the fill are unknown. One well 168 feet deep did not penetrate bedrock. (Woodard-USGS)
W73-05802

UNCONSOLIDATED MATERIALS, HARTFORD NORTH QUADRANGEL, CONNECTICUT,
Geological Survey, Washington, D.C.
F. Pessl, Jr., and C. T. Hildreth.
Available for sale by USGS, Washington, D C 20242 Price - 75 cents. Geological Survey Miscellaneous Geologic Maps, Map I-784-A, 1972. 1 sheet, 1 map, 2 fig, 5 ref.

Descriptors: *Unconsolidated sediments, *Particle size, *Mapping, *Sediments, *Connecticut, Gravels, Sands, Fine aggregates, Till, Swamps, Landslides, Rock fill, Urban mapping, Land development, Cities, Geology, Planning, Engineering structures.
Identifiers: *Hartford north quadrangle (Conn).

This map (scale 1:24,000) is intended to serve as an aid in reconnaissance evaluation of unconsolidated materials and can be used to identify areas of potential land development in the Hartford north quadrangle, Connecticut. The natural materials are assumed to be at least 3 feet thick and lie beneath the soil layer, but the total thickness of the map unit is not indicated. Different materials may underlie each map unit, and each unit may contain minor lenses of other materials. Various colors represent areas of gravel, sand and gravel, sand, fine-grained deposits, till (hardpan), swamp deposits, landslide deposits, artificial fill, urbanized areas, and pits. (Woodard-USGS)
W73-05803

CORRELATION TECHNIQUES AND MEASUREMENTS OF WAVE-HEIGHT STATISTICS,
Stanford Research Inst., Menlo Park, Calif.
For primary bibliographic entry see Field 07B.
W73-05804

LOSS OF INFORMATION BY DISCRETIZING HYDROLOGIC SERIES,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
M. Dyhr-Nielsen.
Colorado State University Hydrology Paper, No 54, October 1972. 57 p, 33 fig, 2 tab, 56 ref, append. OWRR B-030-COLO (6) A-009-COLO (3) NSF Grant GK 11564.

Descriptors: *Hydrology, *Data processing, *Statistical methods, *Estimating, Hydrologic data, Methodology, Sampling, Precipitation (Atmospheric), Runoff, Streamflow, Mathematical studies, Frequency analysis.

Identifiers: Periodic sampling, Extrapolated data.

Although discretization is used almost exclusively in analysis of hydrologic data, very few attempts have been made to evaluate the effect of such a transformation of the original continuous process. A procedure is presented for quantitative evaluation of the loss of information when parameters of continuous stochastic processes are estimated on the basis of discrete sampled data. Three discretization procedures are considered: (1) discrete point sampling, where the process is sampled at periodic time intervals as a series of instantaneous values; (2) average sampling, where the process is sampled as a series of average values; and (3) quantization of the variable, where its values are pooled into class intervals. The decision theoretical concept of 'expected information loss', based on a linear loss function, is used as the measure of information content. For each discretization procedure general expressions for the expected information loss in estimating mean, variance and autocovariance are found as functions of the discretization interval, the length of the sampling period, and the mean, variance and autocovariance of the continuous process. For normal processes the expected information loss is determined for estimation of probabilities of extremes, the mean number of runs, the mean run length and the mean run sum. A stream flow series is analyzed to show the applicability and potential of the approach. (Woodard-USGS)
W73-05806

MAP SHOWING AREAS OF PAST FLOODING IN THE PARKER QUADRANGLE, ARAPAHOE AND DOUGLAS COUNTIES, COLORADO,
Geological Survey, Washington, D.C.
J. O. Maberry.
Available for sale by USGS, Washington, D C 20242, Price - 75 cents. Geological Survey Miscellaneous Geologic Investigations Maps, Map I-770-B, 1972. 1 sheet, 1 map, 4 ref.

Descriptors: *Floods, *Flood damage, *Flood data, *Flood plains, *Colorado, Mapping, Hydrologic data, Land development, Planning, Flood control, Reservoirs, Streamflow, Flow rates, Historic floods.
Identifiers: *Arapahoe and Douglas Counties (Colo), Parker quadrangle (Colo).

A map, scale 1:2400, shows areas of past flooding in the Parker quadrangle, Arapahoe and Douglas Counties, Colorado. The Cherry Creek drainage basin, in which most of the Parker quadrangle lies, has been ravaged many times by floods resulting from heavy rains in the headlands of the basin. Before Cherry Creek Dam was finished in 1958, Cherry Creek flooded parts of Denver near the confluence of Cherry Creek and the South Platte River. Floods of record-breaking intensity in the Cherry Creek basin occurred in June 1965. Most of the map area where the land has been modified by running water in the recent geologic past was covered to some extent by waters of the 1965 storm and flood. All runoff in the basin above the reservoir was stored by the reservoir, thus preventing damage downstream. Areas are shown where the effects of deposition or erosion caused by running water in the recent geologic past are still observable. The map is designed to aid the layman in the planning of land development. (Woodard-USGS)
W73-05807

COMPUTER-BASED OPTIMAL DESIGN OF SEWER SYSTEMS,
Brigham Young Univ., Provo, Utah. Dept. of Civil Engineering.
For primary bibliographic entry see Field 08A.
W73-05809

COMPUTERIZING PIPELINE DESIGN,
Pitometer Associates, Inc., Chicago, Ill.
For primary bibliographic entry see Field 08A.
W73-05810

THE COMPUTER AS AN AID TO ENVIRONMENTAL PLANNING,
University Coll. of Swansea (Wales). Dept. of Civil Engineering.
C. Taylor, and A. Gear.
Journal of Environmental Planning and Pollution Control, Vol 1, No 1, p 24-32, Summer 1972. 5 fig.

Descriptors: *Computers, *Simulation analysis, *Control systems, *Planning, *Management, Water resources, *Dispersion, *Pollutants, Decision making, Alternatives, Optimum development plans, Environmental control, Systems analysis, Mathematical models.
Identifiers: Environmental planning, Air-borne contaminants, Water-borne contaminants.

The use of computers is outlined in the simulation, control planning, and management of two inter-related systems: 1) water resources; and b) dispersion of water- and air-borne contaminants. Simulation is defined as the reproduction of the basic functioning of a system without creating the system itself. Objectives associated with a complex water resources system might easily defy analysis by the largest of computers, and so it is necessary to decompose into two subsystems--supply and distribution. In order to assess fully the impact of contaminants in a system, one must have adequate knowledge of transport processes. Any ecosystem exists in a dynamic state and a full understanding of the interaction between various chemical, physical and biological processes involves a multi-disciplinary approach. The decision-making processes associated with the simplest real system are so complex that even subsystem simulation can only be achieved with some degree of sophistication by utilizing computer techniques. (Bell-Cornell)
W73-05815

08. ENGINEERING WORKS

8A. Structures

CONSTRUCTION OF SABINE RIVER DIVERSION (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Economic Development Administration, Washington, D.C.

Available from the National Technical Information Service as EIS-LA-72-4874-F, $8.75 in paper copy, $0.95 in microfiche. July 12, 1972, 132 p, 1 fig, 5 maps, 4 photo, 13 tab. EOA 08-1-01250.

Descriptors: *Diversion, *Diversion dams, *Water supply, *Environmental effects, *Irrigation canals, *Industrial water, *Louisiana, Saline water intrusion, Industrial wastes, Reasonable use, Water allocation (Policy), Canals, Saline water, Dependable supply, Water delivery, Water quality, Pumping plants, Industrial plants, Drainage systems, Water supply development.
Identifiers: *Environmental impact statements, *Sabine River (La).

This project is for the expansion and improvement of an existing irrigation canal system, plus construction of a new canal, an underground pipeline, four pump stations, bridges and drainage control structures from the Sabine River to the Lake Charles industrial area in Calcasieu Parish, Louisiana. The purpose is to provide a new source of transportation and delivery of raw water to the industries in Lake Charles. The drawing off from present water sources by petroleum and chemical companies has led to a critical water level problem in the parish. Salt water encroachment has already begun. As the result of enlarging the existing canal, a certain amount of farmland and unimproved wooded areas will be occupied. There is no indication of the project having any major impact on wildlife, historical sites or human populations. Alternatives considered included use of the Houston River as a portion of the diversion channel and no action. (Nielsen-Florida)
W73-05229

CLARKS FORK-BULLOCKS CREEK WATERSHED, SOUTH CAROLINA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 04A.
W73-05235

A METHOD FOR ANALYZING EFFECTS OF DAM FAILURES IN DESIGN STUDIES,
Corps of Engineers, Davis, Calif.
W. A. Thomas.
Paper, American Society of Civil Engineers Hydraulics Division Special Conference, Cornell Univ, Ithaca, N.Y., Aug 1972. 27 p, 7 fig, 2 tab, 6 ref.

Descriptors: *Dam design, *Dam failure, *Flood waves, *Model studies, Design flood, Flood routing, Reservoir capacity, Wave energy, Energy loss, Hydrostatic pressure, Unsteady flow, Kinetic energy, Gradually varied flow, Calculations, Evaluation, Hydraulic pressure.
Identifiers: Army Hydrologic Engineering Center, Flood hydrographs, Pressure distribution, Impact loads.

In design studies for a dam to be located downstream from an existing dam, the effects of failure of the upstream structure were calculated and analyzed. The resulting flood wave was calculated and routed through the downstream reservoir and the results used to provide a design for the downstream dam that would allow for this potential dam failure. The analysis utilizes unsteady flow equations to evaluate the effect of the flood wave under 3 different conditions of impoundment in the downstream reservoir at the time of failure. The structure that was assumed to fail was treated as a finite discontinuity in the water surface elevation at an internal point in the computation net rather than as a boundary condition. The design, verification, and use of the digital simulation model for the analysis are presented. (USBR)
W73-05348

IMPROVED INLETS FOR HIGHWAY CULVERTS,
Federal Highway Administration, Washington, D.C.
J. M. Normann.
Paper, American Society of Civil Engineers, Hydraulics Division Special Conference, Cornell University, Ithaca, NY. Aug. 1972. 28 p, 7 fig, 1 tab, 13 ref, 2 append.

Descriptors: *Culverts, Hydraulic design, Flow, Surface drainage, Equations, Coefficients, Conduits, Hydraulic conduits, Hydraulic structures, Head loss, Hydraulics.
Identifiers: *Box culverts, *Entrances (Fluid flow), *Entrance transitions, Wingwalls, Buried pipes, Design improvements, Highway engineering, Noncircular conduits, Rectangular conduits.

Improved inlets may be used to enhance the hydraulic performance of culverts operating in inlet control. Generally, 3 types of structural changes can be made: (1) bevels, (2) side-tapered inlets, and (3) slope-tapered inlets. These structural changes increase the capacity of the culvert inlet by reducing the flow contraction at the face, by enlarging the face area, and by applying more effective head on the control section by sloping the inlet. References used and decisions made in deriving inlet control equations for box culvert inlets ranging from square-edged to slope-tapered are presented. Significant savings can result from

such inlets by improving the hydraulic capacity of existing culverts, or reducing the barrel size required for new culverts. (USBR)
W73-05376

MASTER SEWERAGE SYSTEM PLAN FOR METROPOLITAN MANILA,
Black and Veatch, Kansas City, Mo.
For primary bibliographic entry see Field 05D.
W73-05417

INTERNATIONAL DREDGE MINING,
International Mining Corp., New York.
For primary bibliographic entry see Field 05G.
W73-05439

A VIEW ON CANADIAN DREDGING,
McNamara Marine Ltd., Whitby (Ontario).
For primary bibliographic entry see Field 05G.
W73-05440

AN EXPERIMENTAL APPROACH TO THE USE OF DREDGING SPOIL FOR THE CONSTRUCTION OF SALT MARSH ISLANDS,
Marine Science Inst., Bayou La Batre, Ala.
For primary bibliographic entry see Field 05G.
W73-05445

NITROGEN SUPERSATURATION--COLUMBIA AND SNAKE RIVERS--STATE OF WASHINGTON.
For primary bibliographic entry see Field 06E.
W73-05594

FOUR MILE RUN--ALEXANDRIA, VIRGINIA: SOURIS RIVER--MINOT, NORTH DAKOTA.
For primary bibliographic entry see Field 04A.
W73-05608

VERMILION HARBOR, ERIE COUNTY, OHIO (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Buffalo, N.Y.

Available from the National Technical Information Service as EIS-OH-72-4901-F, $4.00 in paper copy, $0.95 in microfiche. May 3, 1972. 38 p, 1 map.

Descriptors: *Environmental effects, *Channel improvements, *Breakwaters, *Harbors, *Ohio, Benthic fauna, Benthic flora, Engineering structures, Hydraulic structures, Barriers, Rivers, Lake Erie, Channels, Dredging, Safety, Safety factors, Recreation, Waves (Water), Navigation, Spoil banks.
Identifiers: *Environmental Impact Statements, *Vermilion Harbor (Ohio).

The project involves the construction of a detached 'T' type breakwater, two approach channels and a river channel extension at the mouth of the Vermilion River on the shore of Lake Erie in Ohio. The project is designed to permit safe entry into Vermilion Harbor under reasonably fresh weather conditions and to provide adequate depths in the river channel. The approach and extension channels would entail rock excavation and dredging. Material dredged will be deposited in a lake disposal area and will pose no threat to municipal water supply. The City of Vermilion has an excellent small-boat harbor that is one of the largest on the Great Lakes. Under existing conditions it is unsafe for boats to enter or leave the harbor during storms of even moderate intensity. The project will permit safer and more extensive utilization of the harbor during rough weather. Temporary disturbance of benthic aquatic life will result as will the general disruptive effects accompanying construction. The only alternative considered was no action. (Nielsen-Florida)
W73-05609

THE DEVELOPMENT OF MARINA DEL REY,
University of Southern California, Los Angeles. Coastal Zone Planning and Management Project.
For primary bibliographic entry see Field 06B.
W73-05690

THE ECONOMIC SIGNIFICANCE OF THE RHINE-MAIN-DANUBE WATERWAY,
European Economic Commission, Geneva (Switzerland).
For primary bibliographic entry see Field 06B.
W73-05757

THE MAIN-DANUBE CANAL,
For primary bibliographic entry see Field 06B.
W73-05758

COMPUTER-BASED OPTIMAL DESIGN OF SEWER SYSTEMS,
Brigham Young Univ., Provo, Utah. Dept. of Civil Engineering.
L. B. Merritt, and R. H. Bogan.
Journal of the Environmental Engineering Division, American Society of Civil Engineers, Vol. 99, No. EE1, Paper 9578, p 35-53, February, 1973. 5 fig, 3 tab, 12 ref.

Descriptors: *Sewers, *Design criteria, *Computer programs, *Digital computers, *Costs, *Dynamic programming, Optimization, Hydraulic models, Systems analysis, Mathematical models, Flow rates, Manholes, Constraints, Interceptor sewers.
Identifiers: *Cost sensitivity analysis, *Least-cost solutions, Pipe size.

In conventional design practice, complexity and uncertainty have been largely handled by imposing rather conservative general guidelines which simplify the design decisions but tend to mask fundamental functional relationships and system cost considerations. Computer-based computational methods appear promising in rapidly and economically handling sewer design calculations, thus releasing the designer to consider alternative design criteria and various design concepts. A digital computer program that incorporates dynamic programming optimization for identifying least-cost design solutions for a given sewer layout is presented. The results of cost sensitivity analysis of an existing sanitary sewer interceptor system are discussed to illustrate the value and utility of this type of program and to shed light on the cost significance of commonly used design procedures and criteria. Discrete dynamic programming appears to be a powerful and efficient optimization method for sewer design. It appears that the optimizing sewer design programs may result in reduced system costs, providing rapid and inexpensive cost sensitivity and alternative design capability. It is felt that overall cost savings of 10% to 20% or more will typically result from this process. (Bell-Cornell)
W73-05809

COMPUTERIZING PIPELINE DESIGN,
Pitometer Associates, Inc., Chicago, Ill.
W. D. Hudson.
Transportation Engineering Journal, American Society of Civil Engineers, Vol. 99, No. TE1, Paper 9547, p 73-82, February, 1973. 4 fig, 7 ref.

Descriptors: *Water distribution (Applied), *Computer programs, *Simulation analysis, *Pipelines, Mathematical models, Systems analysis, Design, Optimization, Digital computers, Hydraulics, On-site tests.

Computer programming that nearly exactly simulates the operation of water distribution systems is discussed in detail. In order to set up a reliable mathematical model, it is essential to obtain accurate basic data on the existing water distribution system. Before starting the design, extensive field tests are necessary to obtain flows through major trunk mains, coefficients of carrying capacity of the pipelines, consumption rates in the various sections of the system, and to determine water available for fire protection. The model must be checked against actual operation of the water system before computerized design of additional pipelines and other facilities are undertaken. Computer print-outs should show all essential input data and the results obtained in a reasonably clear form for analysis by the design engineer. The future outlook for optimization of cost and complete computerized control of a water system is discussed. (Bell-Cornell)
W73-05810

EVALUATION OF HARBOR DEEPENING PROJECTS,
Calcutta Port Commissioners (India).
For primary bibliographic entry see Field 06B.
W73-05811

CHEBYSHEV-LIKE INEQUALITIES FOR DAM MODELS,
Cornell Univ., Ithaca, N.Y. Dept. of Operations Research.
For primary bibliographic entry see Field 06A.
W73-05812

AN INFINITE DISCRETE DAM WITH DEPENDENT INPUTS,
Western Australia Univ., Nedlands.
For primary bibliographic entry see Field 06A.
W73-05813

METHODS OF FLOW MEASUREMENT IN WELL BORES,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 08B.
W73-05825

GOOD WATER CAN RUIN YOUR WELL,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 08G.
W73-05831

DRILLING WITH MUD - SIMPLE TESTS SAVE TIME AND MONEY,
NL Industries, Inc., Houston, Tex. Baroid Div.
For primary bibliographic entry see Field 08G.
W73-05832

8B. Hydraulics

EXPERIMENTAL INVESTIGATION OF HYDRODYNAMIC STABILITY ON RIGID AND ELASTIC DAMPING SURFACES,
Akademiya Nauk URSR, Kiev. Inst. of Hydromechanics.
V. V. Babenko, and L. F. Kozlov.
Journal of Hydraulic Research, Vol 10, No 4, p 383-408, 1972. 10 fig, 26 ref.

Descriptors: *Turbulence, *Turbulent flow, *Transition flow, *Turbulent boundary layers, Laminar flow, Critical flow, Reynolds number, Hydraulics.
Identifiers: *Damping (Turbulence).

Hydrodynamic stability was studied in a water flow conducted in a low-turbulence hydrodynamic test bench on a rigid surface and on elastic damping surfaces. Limiting curves may be used to estimate qualitatively the effect of the nonlinearity of the exciting oscillations and finite disturbances on hydrodynamic stability. They also give insight into

the physical nature of turbulence initiation. For the best damping surface, oscillations were observed only in a layer not exceeding 20% of the thickness of the boundary layer, but the maximum velocities and kinetic energy of the exciting motionwere on average half that for the case of flow around a rigid surface. With flow around rigid surfaces the stability decreased because the region of unstable oscillation frequences increased. With flow around the best of the flexible surfaces, the Reynolds number of the stability loss was 50% larger than that for the case of flow around the rigid surface for sinusoidal disturbances. (Knapp-USGS)
W73-05319

REYNOLDS STRESS MEASUREMENTS IN HYDRAULIC JUMPS,
Toronto Univ. (Ontario). Dept. of Mechanical Engineering.
For primary bibliographic entry see Field 02E.
W73-05320

THE INFLUENCE OF SURFACE TENSION ON WEIR FLOW,
Sheffield Univ. (England).
For primary bibliographic entry see Field 02E.
W73-05321

SELECTIVE WITHDRAWAL FROM A TWO LAYERED FLUID,
Canterbury Univ., Christchurch (New Zealand). Dept. of Civil Engineering.
For primary bibliographic entry see Field 02E.
W73-05323

OVERTOPPING OF SLOPE BREAKWATERS,
Laboratorio Nacional de Engenharia Civil, Lisbon (Portugal).
D. Vera-Cruz.
Bulletin of the Permanent International Association of Navigation Congresses, No 12 (1972), p 97-105.

Descriptors: *Breakwaters, *Shore protection, *Harbors, *Barriers, Hydraulics, Hydraulic structures, Overflow, Ocean waves.
Identifiers: *Wave flumes, *Run-up.

Porous, rough quarry-stone breakwater sections were tested in a wave flume to determine the conditions of overtopping of rubble-mound breakwaters. The influence of porosity and roughness was not investigated, since this did not vary during the tests. Two different slope angles of the breakwater section were tested: i equals cot alpha equals 5/4 and i equals cot alpha equals 2/1. Dimensionless relations are presented for each slope angle, correlating wave height, relative depth, crest elevation, and crest width. The results are extended to the limit case of crest width equal to zero, in which case the results would correspond to a situation of run-up. (OWRR)
W73-05351

EQUILIBRIUM CROSS-SECTION OF MEANDERING AND BRAIDED RIVERS,
Ife Univ. (Nigeria). Dept. of Geology.
I. G. Wilson.
Nature, Vol 241, p 393-394, February 9, 1973. 2 fig, 8 ref.

Descriptors: *Channel morphology, *Bed load, *Vortices, *Alluvial channels, Turbulent flow, Meanders, Particle size, Braiding, Streams, Open channel flow, Sediment transport, Sedimentation.

Two simple models describe the equilibrium state of a channel cross-section with constant conditions. In the static case, all grains on the bed are just at the threshold of movement. Because the fluid drag is greatest in the center of the channel, the channel slopes increase up the sides to compensate for the decrease in drag. The resulting profile is roughly a parabola and is very similar to many natural channel/forms. In the dynamic case, with transport of sediment, the mean channel form develops at high stages when nearly all the bed material is in intermittent motion. When sediment is transported as bed load, the tendency of sediment is to creep downslope into the center of the channel and is opposed by an equal and opposite tendency for the sediment to be moved sideways upslope. As water flowing sideways along the bed must return to the channel center along the surface, this implies that the river has double spiral secondary flow. In bends, one/vortex is excluded at the crest. The same hypothesis of double spiral flow is commonly used to explain the origin of many sand ridges parallel to flow, such as primary current lineation, sand ribbons, tidal current ridges, and longitudinal aeolian dunes and draas. (Knapp-USGS)
W73-05488

HYDRAULIC DESIGN OF SELF-CLEANING CIRCULAR SANITARY SEWERS,
West Virginia Inst. of Tech., Montgomery.
For primary bibliographic entry see Field 05D.
W73-05645

SINUOSITY OF SUPRAGLACIAL STREAMS,
Hull Univ. (England). Dept. of Geography.
For primary bibliographic entry see Field 02E.
W73-05680

HYDRAULIC DRAG: A MEANDER-INITIATING MECHANISM,
Herbert H. Lehman Coll., Bronx, N.Y. Dept. of Geology and Geography.
For primary bibliographic entry see Field 02E.
W73-05682

MEAN TURBULENT FLOW IN THE ENTRY REGION OF A ROUGH PIPE,
Naval Ship Research and Development Center, Bethesda, Md.
J. P. Tullis, and J-S. Wang.
Available from NTIS, Springfield, Va 22151 as AD-747 278 Price $3.00 printed copy; 95 cents microfiche. Report CER72-73JPT-JSW-2, July 1972. 123 p, 30 fig, 15 tab, 17 ref, 2 append. Contract N00014-67-A-0299-0013.

Descriptors: *Turbulent flow, *Pipe flow, *Orifice flow, *Closed conduits, *Model studies, Average flow, Roughness (Hydraulic), Hydraulic conduits, Flow characteristics, Mathematical models, Shear stress, Equations, Velocity, Boundary layers, Reynolds number, Analytical techniques, Correlation analysis, Design criteria.
Identifiers: *Rough pipes.

General characteristics of mean turbulent flow in the entry region of a pipe and the development of wall shear stress, velocity profile, core velocity and boundary layer thickness were studied. In formulating a mathematical model for predicting boundary layer growth in developing flow, the momentum and continuity equations were used with assumptions of (1) potential flow in the core region, (2) a semilog velocity profile for the boundary layer and (3) a measured resistance formula from the experimental data. The model can predict satisfactorily within the first 10 to 12 pipe diameters. Beyond that point turbulent intermittency of the boundary layer disturbs the core and invalidates the potential core assumption. The experimental data were obtained in a 12-inch diameter by 200-foot long hydraulically rough pipe. Turbulence was suppressed and a developing boundary layer formed by a 5-foot diameter, 20-foot long settling chamber with a converging nozzle. Water was used as the fluid. Reynolds numbers varied between 700,000 and 3,000,000. (See also W73-05688) (Woodard-USGS)
W73-05687

POLYMER INJECTION FOR DRAG REDUCTION,
Naval Ship Research and Development Center, Bethesda, Md.
J. P. Tullis, and L. F. Lindeman.
Available from NTIS, Springfield, Va 22151 as AD-747 274 Price $3.00 printed copy; 95 cents microfiche. Report CER72-73JPT-LFL-1, July 1972. 94 p, 19 fig, 5 tab, 18 ref. Contract N00014-67-A-0299-0013.

Descriptors: *Viscous flow, *Pipe flow, *Closed conduits, *Polymers, *Fluid mechanics, Drag, Roughness (Hydraulic), Flow characteristics, Analytical techniques, Mathematical studies, Equations, Reynolds number, Data collections, Shear stress, Friction, Pressure, Viscosity, Velocity, Boundary layers, Design criteria.
Identifiers: *Rough pipes.

Viscous drag reduction caused by polyethelene oxide injection into a developing turbulent boundary layer was investigated in a 12-inch I.D. hydraulically rough pipe. Pressure drop measurements were made in the first 200 diameters of the pipe. Velocity profile and concentration profile measurements were also taken. The Reynolds numbers range from 600,000 to 3,000,000 with shear stresses up to 3000 dynes/sq cm and velocities up to 46 ft/sec. Injection concentrations varied between 100 to 2400 ppm with mixed concentrations up to 24 ppm. The injection flow rate varied from 34 to 170 gal/min. Drag reductions above 90% were realized in the inlet region for lower injection concentrations. For a given polymer injection rate, drag reduction in the inlet region decreases with increasing injection concentration. Some shear degradation of the polymer in the fully developed flow region was observed throughout the above range of Reynolds numbers. The procedure developed for polymer mixing allows rapid preparation of large quantities of concentrated polymer solutions. (See also W73-05687) (Woodard-USGS)
W73-05688

EFFECT OF VEGETAL LENGTH AND SPATIALLY VARIED FLOW ON VELOCITY DISTRIBUTION COEFFICIENTS,
Department of Agriculture, Stillwater, Okla.
D. K. McCool.
Transactions of the ASAE, (American Society of Agricultural Engineers), Vol 13, No 5, p 603-607, May 1970.

Descriptors: *Open channel flow, *Grassed water ways, Canal design, Roughness (Hydraulic).
Identifiers: Spatially varied flow.

Experiments were conducted to test the applicability to the runoff generation process of the spatically varied flow equations. Effects of grass length and spatially varied flow on the Coriolis or velocity head coefficient and on the Boussinesq or momentum coefficient in equations for open channel flow are illustrated. This information reduces the undefined variables in testing the hypothesis of the spatially-varied flow equations and aids in the design of grass channels. Conclusions were: (1) Coriolis and Boussinesq coefficients are a linear function of grass length to hydraulic radius. (2) Spatially varied flow had no effect on the Coriolis and Boussinesq coefficients. (3) Coriolis and Boussinesq coefficients were much larger than expected. (4) Coriolis coefficient has a significant effect on energy slope and hence on Manning's coefficient where curvilinear flow in a small grassed channel is involved. (Skogerboe-Colorado State)
W73-05720

THE APPROPRIATE GRADE OF A GATED PIPE,
South Dakota State Univ., Brookings. Dept. of Agricultural Engineering.

S. T. Chu, and D. L. Moe.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol 14, No 4, p 727-733, April 1971. 1 fig, 2 tab, 5 ref.

Descriptors: *Hydraulics, *Hydraulic gradient, *Irrigation systems, *Pipe flow, Irrigation engineering, Head loss.
Identifiers: *Gated pipe.

The general solution of the hydraulic grade line of a lateral with uniform outflow from equally spaced outlets is obtained. A numerical table and approximate formula are presented to facilitate the determination of the hydraulic gradient of a gated pipe system. (Skogerboe-Colorado State)
W73-05730

A GENERAL RELAXATION THEORY OF SIMPLE LIQUIDS,
Case Western Reserve Univ., Cleveland, Ohio.
M. Merilo, and E. J. Morgan.
Available from NTIS, Springfield, Va., 22151, as NASA CR-2141, Price $3.00 printed copy; $0.95 microfiche. National Aeronautics and Space Administration Contractor Report NASA CR-2141, January 1973. 121 p, 15 fig, 1 tab, 60 ref. NASA Grant NGL 36-003-064, NSF Grant GK-02866.

Descriptors: *Fluid mechanics, *Fluid friction, *Steady flow, *Viscosity, Theoretical analysis, Equations, Liquids, Mathematical studies, Flow characteristics, Stress, Strain, Molecular structure, Thermodynamics, Unsteady flow, Shear stress.
Identifiers: Simple liquids, *Relaxation theory (Liquids).

A relatively simple relaxation theory to account for the behavior of liquids under dynamic conditions is proposed. Though rigorous kinetic theory is not employed, the theory is, nevertheless, based on a molecular viewpoint. The general dynamical equations are similar in form to the phenomenological relaxation equations used in theories of viscoelasticity; however, they differ in that all the coefficients of the present equations are expressed in terms of thermodynamic and molecular quantities. The thoery is based on the concept that flow in a liquid distorts both the radial and the velocity distribution functions, and that relaxation equations describing the return of these functions to their isotropic distributions, characterizing a stationary liquid, can be written. The theory has been applied to the problems of steady and oscillatory shear flows and to the propagation of longitudinal waves. In all cases classical results are predicted for low strain rates, and an expression for vicosity of a liquid, similar to the Macedo-Litovitz equation, is obtained. At high strain rates viscoelastic behavior is predicted, and for steady shear normal stresses and a reduction in the apparent viscosity are obtained. The reduction in apparent viscosity is attributed to the enhanced jump probability of a molecule in a strained liquid. For high frequency oscillatory flows the behavior of a liquid in the measurable frequency range is characterized by a single relaxation time. To account for the observed width of the relaxation region and the measured excess absorption in monatomic liquids it will probably be necessary to add the effects of molecular clusters to the theory. (Woodard-USGS)
W73-05792

METHODS OF FLOW MEASUREMENT IN WELL BORES,
Geological Survey, Washington, D.C.
E. P. Patten, Jr., and G. D. Bennett.
Geological Survey Water-Supply Paper 1544-C, 1962. 28 p, 13 fig, 1 tab, 12 ref.

Descriptors: Flow, *Flow measurement, Flow rates, Wells, *Water wells, Oil industry, Brines, Current meters, *Electrical well logging, Logging (Recording), Electrical conductance, Electrochemistry, Calibrations, Thermal properties.
Identifiers: Flowmeters, Thermal flowmeters, Radioactive tracers.

Three methods of borehole-flow measurement particularly suitable for use in a water well are explained: the brine-tracing method, use of the thermal flowmeter, and use of the Au current meter. The brine-tracing method is the most troublesome to use, because both logging and brine-injection equipment must be in the well. The method is unsatisfactory for single-point or -instant measurements, but is well suited to measurement of slow flow through a long borehole. The response of the thermal flowmeter is an electric current which is proportional to the flow velocity in the well bore. The meter tested gave reliable results in the velocity range from 2 to 75 feet per minute. The Au current meter, used by the Geological Survey for many years is convenient and fairly reliable. However, istantaneous recordings of velocity are not possible, and the meter will not respond below a certain low velocity. A brine-dilution technique, along with several methods used in the oil industry are briefly reviewed. (Campbell-NWWA)
W73-05825

8C. Hydraulic Machinery

FIELD TESTS OF THE 345-KV SHUNT REACTOR COMPENSATED FORT THOMPSON--GRAND ISLAND LINE - PICK-SLOAN MISSOURI BASIN PROGRAM,
Bureau of Reclamation, Denver, Colo.
G. W. Cleaveland.
Bureau of Reclamation Report REC-ERC-72-21, June 1972. 17 p, 7 fig, 1 photo, 5 tab, 4 chart, 4 ref.

Descriptors: *On-site investigations, *Protective relaying, *Shunt reactors, *Short circuits, Circuit breakers, Electric arcs, Electrical equipment, Instrumentation, Induced currents, Mobile laboratories, Switchyards (Electrical), Switchgear, Timing circuits, Voltage dividers.
Identifiers: *Staged fault tests, Point-on-cycle switching, Transfer tripping, Test results, Autotransformers, Electrical restrikes, Protective.

Field tests were conducted on the Bureau's 241.7-mi, 345-kv shunt reactor compensated, Fort Thompson-Grand Island Line to evaluate line switching performance and relay protection--a scheme using dual-channel direct underreaching transferred tripping with solid-state relays and permissive underreaching transferred tripping with electromechanical relays. Conclusions are that the line can be switched satisfactorily from either terminal provided the low-voltage air core reactors are in service at each station. No ferroresonance or overvoltage problems were encountered during switching tests. Except for trouble in one transfer trip receiver, later corrected, the dual-channel direct underreaching transferred trip relaying and the permissive underreaching transferred trip relaying operated according to design requirements. Tables and a summary of the tests and information on peak fence-line voltages during the tests are presented. (USBR)
W73-05343

POWER SYSTEM STABILIZATION WITH HIGH INITIAL RESPONSE EXCITATION ON LARGE HYDROELECTRIC GENERATORS,
Bureau of Reclamation, Denver, Colo.
L. E. Eilts, W. B. Gish, and F. R. Schleif.
Bureau of Reclamation Report REC-ERC-72-18, June 1972. 33 p, 26 fig, 2 tab, 1 chart, 19 ref, 2 append.

Descriptors: *Voltage regulations, Electric generators, Transmission (Electrical), Control, Governors, Evaluation, Stabilization, Electric potential, Frequency, Washington, Analog models, Bibliographies.
Identifiers: *Power system stabilizer, *Power system stability, *Electric analogs, *Excitation, Grant Coulee Powerplant (WA), Columbia Basin Project (WA), Damping circuits, Sensors.

In considering appropriate parameters for a power system stabilizer application to a high initial response excitation system on large hydroelectric generators, basic power system dynamics were reviewed. After considering many alternatives, frequency compensated to the internal shaft speed was chosen for input to 2 lead stages of compensation as a supplementary signal to the voltage regulator. Topics discussed include several damping signals, selection of stabilizer time constants, limits and gain, and coordination with electrohydraulic governors. Analog modeling techniques used are described. (USBR)
W73-05344

INSULATION CO-ORDINATION IN HIGH VOLTAGE D.C. CABLES,
Phelps Dodge Cable and Wire Co., Yonkers, N.Y.
G. Bahder, F. G. Garcia, and A. S. Brookes.
Paper 21-03, International Conference on Large High Tension Electrical Systems (CIGRE), Paris, France, Aug-Sept 1972. 11 p, 3 fig, 5 tab, 7 ref.

Descriptors: *Direct current, *High voltage, *Underground transmission lines, *Electrical insulation, Electric cables, Stress, Lightning, Electric potential, Electric power, Reliability, Polarization, Transmission (Electrical).
Identifiers: *Insulation coordination, *Lightning surges, *Underground cables, Breakdown, Voltage gradients, Basic impulse level, Space charge, Oil-filled cables, Transients, Electrical faults, Switching surges, Dielectric properties.

Underground transmission systems operating at HVDC voltages have been highly reliable. Advantages of d-c cable transmission in large power systems are that the cables: (1) do not contribute to fault currents, and (2) provide an asynchronous tie for 2 large power systems, a valuable characteristic under conditions of fault or unusual load disturbances. Insulation coordination in d-c cables is radically different than in a-c cables. Analysis of transients in d-c cable systems indicate that the severest transient condition occurs when a lightning surge of opposite polarity is superimposed on the d-c voltage. Under this condition, the maximum stress causing the breakdown in the cable consists of 3 components: a transient component caused by the lightning surge, a d-c component caused by space charge stored in the cable insulation, and a polarization component caused by space charge stored in the insulation. Results of tests on flat insulation samples, solid-type cables, and oil-filled cables indicate values of each component and provide a basis for coordinating d-c cable insulation. (USBR)
W73-05346

REMOVAL OF RICE CARGO FROM SUNKEN SHIP WITH 28 INCH SUCTION DREDGE,
Panama Canal Co., Balboa Heights Canal Zone.
W. W. Fade.
In: IV Proceedings of WODCON, World Dredging Conference, Dec. 1-3, 1971, New Orleans, Louisiana, WODCON Association, San Pedro, California, p 363-385, 1972. 14 fig, 1 tab.

Descriptors: *Dredging, *Panama Canal, *Technology, Disposal, Spoil banks, Water pollution.
Identifiers: *SS Sian Yung, *Hydraulic dredging, *Cargo tanks.

The problems involved in removing the rice cargo from the SS Sian Yung, sunk in the Panama Canal, are described. Various methods were considered; it was ultimately decided to try hydraulically dredging the rice from the ship's holds. This solution would remove the water already contaminated, as well as the cargo. The many aspects of the dredging operation are described. The rice

which was dredged could not be used for animal feed, so it was covered with sediment from the canal bottom and converted into a sanitary land fill. (Ensign-PAI)
W73-05442

PUMPING STATIONS,
Kraus, Schanzlin and Becker A. G., Frankenthal (West Germany).
For primary bibliographic entry see Field 05D.
W73-05623

AUTOMATIC CONTROL SYSTEMS,
West Hertfordshire Main Drainage Authority, Rickmansworth (England).
For primary bibliographic entry see Field 05D.
W73-05657

A SUCTION DREDGE FOR COLLECTING BIOMPHALARIA AND OTHER MOLLUSCS FROM DEEP WATER,
Ministry of Health, Kampala (Uganda). Vector Control Div.
For primary bibliographic entry see Field 07B.
W73-05719

SELECTIVE CORROSION AND DEEP-WELL TURBINE PUMP DESIGN,
Alameda County Water District, Fremont, Calif.
For primary bibliographic entry see Field 08G.
W73-05830

HIGH PRESSURE JET DRILLING,
Esso Production Research Co., Linden, N.J.
For primary bibliographic entry see Field 08G.
W73-05833

8D. Soil Mechanics

THE MECHANICAL STRENGTH OF UNSATURATED POROUS GRANULAR MATERIAL,
Agricultural Research Council, Cambridge (England). Unit of Soil Physics.
For primary bibliographic entry see Field 02G.
W73-05490

EARTHQUAKE RESISTANCE OF EARTH AND ROCK-FILL DAMS: REPORT 3--FEASIBILITY OF SIMULATING EARTHQUAKE EFFECTS ON EARTH AND ROCK-FILL DAMS USING UNDERGROUND NUCLEAR EVENTS.
Army Engineer Waterways Experiment Station, Vicksburg, Miss.

Available from NTIS, Springfield, Va., 22151 as AD-748 816, Price $3.00 printed copy; $0.95 microfiche. Miscellaneous Paper S-71-17, September 1972. 247 p, 33 fig, 133 plate, 10 tab, 28 ref, 4 append.

Descriptors: *Feasibility studies, *Earthquakes, *Earth dams, *Rockfill dams, *Nuclear explosions, Planning, Design criteria, Dams, Engineering structures, Hydraulic structures, Evaluation, Costs, Reviews.
Identifiers: Earthquake resistance dams.

Little information and experience are available regarding the earthquake resistance of earth and rockfill dams. The Advisory Board for Soil Mechanics of the Office, Chief of Engineers, suggested the possibility of subjecting a test embankment to ground motions produced by underground nuclear explosions. The Board suggested that the Waterways Experiment Station investigate the feasibility of such a test on a 50-ft-high, 300- to 400-ft-long embankment. Close-in ground-motion records from underground nuclear events Faultless, Boxcar, and Benham were obtained, analyzed, and compared to observed earthquake motion to evaluate the suitability of simulating earthquake motion by nuclear-generated motion. A comparison of nuclear and earthquake motions was made, and an estimate of the magnitude of permanent embankment displacement caused by both energy sources was calculated. Several sites on Pahute Mesa, Nevada Test Site, appear to be satisfactory for constructing a test dam. A configuration for testing a 50-ft-high embankment,an estimate of the probable cost of the experiment, and a schedule for accomplishing the experiment are proposed. (Woodard-USGS)
W73-05789

8E. Rock Mechanics and Geology

THE INFLUENCE OF MICRO-STRUCTURE ON ROCK FRACTURE ON THE LABORATORY SCALE,
James Cook Univ. of North Queensland, Townsville (Australia); and Minnesota Univ., Minneapolis.
E. T. Brown, and J. A. Hudson.
Paper 11-20, Rock Fracture, Proceedings, International Symposium on Rock Mechanics, Nancy, France, Oct. 1971. 11p, 7 fig, 17 ref.

Descriptors: *Rock properties, *Fractures (Geologic), *Rock mechanics, Servomechanisms, Failure (Mechanics), Tensile properties, Laboratory tests, Compression tests, Bibliographies, Cracks, Rocks, Porosity.
Identifiers: *Brittle fractures, *Micro structure, *Rock tests, Failure surfaces, Stress-strain curves, Flexural strength, Grain sizes, Tension tests.

A servocontrolled testing system recently developed at the University of Minnesota permits detailed study of the structural breakdown process in a variety of laboratory tests. Using this technique, the influence of microstructure on the fracture morphology and load-deflection characteristics of rocks has been studied. For example, in controlled diametral compression and flexure tests, a single fracture plane starting in the region of maximum tensile stress occurs only in very fine grained, homogeneous rocks. In coarser grained crystalline rocks, a series of shorter, noncoplanar cracks develop with the result that even when the load-bearing capability of the specimen has been reduced to almost zero in a controlled test, a single failure plane still has not formed. Similarly, in uniaxial compression tests, grain size and porosity are prime determinants of fracture morphology and shape of the complete stress-strain curve. For rocks with similar mineralogy, compressive strength decreases with increasing grain size and porosity. Special consideration is given to the differences in fracture development in compression and tension tests. (USBR)
W73-05377

MONTE CARLO APPROACH TO SEEPAGE IN JOINTED ROCK,
Notre Dame Univ., Ind. Dept. of Civil Engineering.
W. E. Kelly.
In: Stability of Rock Slopes, Proceedings of 13th Symposium on Rock Mechanics, University of Illinois, Urbana, August 30-September 1, 1971: New York, NY, American Society of Civil Engineers, p 227-241, 1972. 3 fig, 18 ref.

Descriptors: *Seepage, *Monte Carlo method, *Simulation analysis, *Mathematical models, Computer models, Slope stability, Dams.

The continuous Monte Carlo method may be used for determining seepage potential values in a jointed medium. The method is extremely versatile with respect to the permeability distributions which may be handled. Because of computer time requirements, the Monte Carlo method is recommended where only potentials at a few critical points are required. With carefully written programs and by solving for all required points simultaneously, immense savings in computer time may be realized. One distinct advantage of Monte Carlo techniques is that with a digital computer there is a minimal storage requirement. Special computers have been built to solve seepage problems using Monte Carlo techniques and employing a minimal storage capability. (Knapp-USGS)
W73-05478

SLOPE STABILITY IN TROPICALLY WEATHERED DIORITE,
Acres International Ltd., Niagara Falls (Ontario).
A. H. Merritt.
In: Stability of Rock Slopes, Proceedings of 13th Symposium on Rock Mechanics, University of Illinois, Urbana, August 30-September 1, 1971: New York, NY, American Society of Civil Engineers, p 625-641, 1972. 6 fig.

Descriptors: *Slope stability, *Weathering, *Soil mechanics, *Rock mechanics, Structural geology, Folds (Geologic), Fractures (Geologic), Geologic control.
Identifiers: *Alto Anchicaya (Colombia).

The engineering behavior of the slopes in tropically weathered diorite at Alto Anchicaya, Colombia, is a function of the natural weathering products of rock which are present on the original slopes. These weathering products depend upon the general morphology of the terrain and the angle of the major joint sets parallel to the slopes. Therefore, the design of slopes for permanent structures will vary depending on whether the slope is governed by soil-like conditions whose principal component is either completely weathered rock or sand; weathered rock whose stability depends upon the angle of inclination of the major joint systems; or the combination of both. (Knapp-USGS)
W73-05479

PORE FLUID AND THE MECHANICAL BEHAVIOR OF ROCK,
Minnesota Univ., Minneapolis. Dept. of Civil and Mineral Engineering.
F. H. Cornet.
In: Stability of Rock Slopes, Proceedings of 13th Symposium on Rock Mechanics, University of Illinois, Urbana, August 30-September 1, 1971: New York, N.Y., American Society of Civil Engineers, p 825-844, 1972. 3 fig, 30 ref.

Descriptors: *Rock mechanics, *Pore water, Mechanical properties, Deformation, Foundations, Pressure, Rock properties, Water chemistry, Friction, Slope stability.

Pore fluid influences the behavior of rock subjected to a triaxial state of stress. The fluid has a direct action on the matrix of the rock; the unit surface energy value and coefficient of friction are altered and the matrix can be chemically dissolved. In addition, if the rock is saturated, pore pressure modifies the state of stress and decreases the principal stress values. Theoretical and experimental aspects of the pore fluid effect are discussed. The presence of pore fluid can accentuate the brittleness of the rock. The pore pressure may be used as a parameter to represent, qualitatively or quantitatively, the state of failure in a specimen tested in undrained conditions. (Knapp-USGS)
W73-05674

FRACTURE RESERVOIRS,
Curry Oil Co., Casper, Wyo.
For primary bibliographic entry see Field 08G.
W73-05820

8F. Concrete

NON-LINEAR ANALYSIS OF REINFORCED CONCRETE SLABS,
IBM World Trade Corp., Wellington (New Zealand); and Canterbury Univ., Christchurch (New Zealand).
J. C.Bell, and D. G. Elms.
Magazine of Concrete Research, Vol. 24, No. 79, p. 63-70, June 1972. 14 fig, 11 ref.

Descriptors: *Slabs, *Reinforced concrete, *Model studies, *Structural analysis, Theoretical analysis, Finite element method, Digital computers, Reinforcing steels, Computer models, Anisotropy, Deflection, Cracks, Moments.
Identifiers: *Nonlinear programming, New Zealand, Test results, Concrete slabs, Curvature, Experimental data, Nonlinear properties.

A complex modeling technique is used to obtain more complete information on the behavior of reinforced concrete slabs between the loading range of zero to failure. The finite element method is used as the basis of the analysis, and nonlinear constitutive relationships are derived from the fundamental properties of the concrete and reinforcing steel. Modeling assumptions are discussed; moments, deflections, and crack patterns produced are presented. To illustrate the model, an analysis of a slab is compared with experimental results. Potential uses describedfor this complex model are: (1) analyzing serviceability of slabs throughout the loading range, (2) investigating effects of physical parameters, and (3) studying the sensitivity of theoretical results to different assumptions. (USBR)
W73-05340

DETERMINING THE WATER CONTENT OF CONCRETE PANELS BY USING A MICROWAVE MOISTURE METER,
Building Research Station, Watford (England).
J. Figg.
Magazine of Concrete Research, Vol. 24, No. 79, p. 93-96, June 1972. 4 fig, 1 tab.

Descriptors: *Nondestructive tests, Moisture content, Durability, Frost action, Laboratory tests, Absorption, Moisture meters, *Concrete tests, Concrete technology, Test procedures.
Identifiers: *Microwave meters, *Moisture sensors, *Water content, Test results, Great Britain, Panels, Precast concrete, Experimental data, Sulfate attack.

Because the durability of concrete is governed largely by the degree of free water content of hardened concrete, a reliable nondestructive technique is needed for measuring the water content. One highly effective technique, absorption spectroscopy in the microwave region, is described. One- by 2-m sections, sawn from commercial concrete panels, were tested with a microwave moisture meter to establish calibration curves for different types of concrete cladding panels. Test results confirmed that the relationship between microwave attenuation and percentage of absorbed water for such panels was linear, but the slope of the curve depended upon the particular construction of the concrete panel. With 10% absorbed water, the microwave attenuation varied between approximately 10 and 20 db. Anomalous results obtained during freezing weather were attributed to molecular orientation of the water in the concrete. (USBR)
W73-05341

CRACKING CONTROLLED IN MASSIVE, REINFORCED STRUCTURAL CONCRETE BY APPLICATION OF MASS CONCRETE PRACTICES,
California State Dept. of Water Resources, Sacramento.
L. H. Tuthill, and R. F. Adams.
Journal of the American Concrete Institute, Proceedings, Vol 69, No 8, p 481-491, Aug 1972. 16 fig, 1 tab, 7 ref.

Descriptors: *Concrete construction, *Temperature, *Cracks, *Mass concrete, Concrete control, Consolidation, Construction joints, Permeability, Reinforced concrete, Vibration, Pumping plants, Concrete mixes, Cooling, Curing, Pozzolans, Seepage, Strength, Concrete technology, Contraction joints, Watertight.
Identifiers: Cement content, Control joints, Admixtures, Power plants, Placing.

By applying mass concrete practices, massive concrete structural sections of power and pumping plants had less cracking and were more watertight. Cold concrete, with the lowest cement content feasible and a minimum of construction and contraction joints, was used. Particular effort was made to secure watertightness of horizontal construction joints by giving special attention to requirements for cleanup and bonding. Placement of special concrete, selected for lowest heat evolution and temperature rise, is discussed. A table summarizing special concrete mix data and strength results shows that the lean concrete has ample strength. Performance reports, after 9 of the 10 plants had been exposed to 2 to 6 cold seasons, indicated very few cracks between contraction joints spaced at a minimum of 70 ft. Little or no leakage into submerged pumping plants had occurred compared to others where the special procedures were not followed. (USBR)
W73-05342

8G. Materials

PROBLEMS AND SOLUTIONS IN LARGE SCALE EVAPORATION,
Catalytic, Inc., Philadelphia, Pa.
For primary bibliographic entry see Field 03A.
W73-05647

POLYMER INJECTION FOR DRAG REDUCTION,
Naval Ship Research and Development Center, Bethesda, Md.
For primary bibliographic entry see Field 08B.
W73-05688

ANALYSIS OF SEDIMENT SHEAR STRENGTH AT VARYING RATES OF SHEAR,
Naval Academy, Annapolis, Md.
J. E. Halwachs.
Available from NTIS, Springfield, Va 22151 as AD-749 671 Price $3.00 printed copy; 95 cents microfiche. Naval Academy Trident Scholar Project Report No 28, 1972. 24 p, 8 fig, 18 ref, 2 append.

Descriptors: *Sediments, *Shear strength, *Shear stress, Testing procedures, Model studies, Bottom sediments, Oceans, Analytical techniques, Equipment, Evaluation, Data collections, Resistance, Strain, Measurement.
Identifiers: *Vane shear test, *Marine sediments, Rotational torque, Vane blade.

The vane shear apparatus is a device used to determine the shearing strength of marine sediment. The vane blade is inserted into a sample of sediment and a rotational torque is applied to the shaft of the vane blade. The resistance to this rotation is measured as torque and, knowing the area of the failure surface, is converted to the shear strength of the sediment in terms of lbs/sq in. The variation in pore water pressure and viscous friction with rate of strain affects the value of the shear strength determined by the vane shear test. The effect of rate of strain on shear strength of cohesive soils was studied in ocean sediments of varying permeabilities with various rates of shear. A variation in shear strength as high as 46.4% was found over the range of rotation rates used in this experiment. (Woodard-USGS)
W73-05694

FRACTURE RESERVOIRS,
Curry Oil Co., Casper, Wyo.
W. H. Curry, III.
Wyoming Geological Association WGA Earth Science Bulletin, Vol 5, No 3, p 13-16, September, 1972. 3 fig.

Descriptors: *Fracture permeability, *Fractures (Geologic), *Logging (Recording), Electrical well logging, Exploration, *Geologic control, Hydrofracturing, Drilling fluids, *Oil reservoirs.
Identifiers: Density log, Formation damage, Drill stem test.

Fracture porosity, as opposed to sandstone and carbonate primary or secondary porosity, is emphasized. The major problem in the utilization of fracture porosity to best advantage is the difficulty of recognition and evaluation. A method of recognizing potentially productive fracture zones using density logs is shown. Ideally, a prospective fracture zone would have offscale (greater than 30%) density log porosity in a hard brittle rock. In order to define the three dimensional complex of associated fractures it is helpful to study the surface expression of such fractures. An example is given of a fracture complex composed of three interlocking sets; well penetration into one single fracture would allow drainage from the whole complex of associated fractures. (Campbell-NWWA)
W73-05820

SELECTIVE CORROSION AND DEEP-WELL TURBINE PUMP DESIGN,
Alameda County Water District, Fremont, Calif.
J. D. Newton.
Journal of the American Water Works Association, Vol. 64, No. 8, p 492-496, August, 1972. 7 tab, 3 ref.

Descriptors: Wells, *Water wells, Erosion, *Pumps, Pump turbines, Materials, *Materials testing, Protective coatings, Corrosion, *Corrosion control, Cost analysis, Specifications.
Identifiers: Selective corrosion, Cast iron, Ductile iron.

Several facts were established by the experience of a California water district regarding equipment life affected by selective corrosion. 1) The possibility of determining corrosiveness of well water by reasonable, present-day methods is remote. 2) Selective corrosion can be a serious problem and may adversely affect cast-iron pumping equipment. Often the affected unit will fail within 2 or 3 years. 3) Although there are added costs in selecting appropriate metals other than cast iron for corrosive service, extended efficient operation will often offset the first-cost differentials. The austenitic D2B material substituted for cast iron in a well with known corrosive water has been an unqualified success. The bronzes were definitely superior to cast iron in waters where cast iron corroded selectively; however, the austenitic D2B was superior to either bronze used in the study. The data would seem to indicate that bronze would be a good selection for booster-pump application. (Campbell-NWWA)
W73-05830

GOOD WATER CAN RUIN YOUR WELL,
Geological Survey, Washington, D.C.
F. E. Clarke.
Water Well Journal, Vol. 25, No. 1, p 39-45, January, 1971.

Descriptors: Corrosion, *Corrosion control, Water quality, *Irrigation wells, Cooling towers,

Deep wells, Electrochemistry, Economics, *Materials, Equilibrium, *Chemical precipitation, Carbonates, Cathodes, Anodes, Oxidation reduction potential, Hydrogen ion concentration.
Identifiers: Incrustation, Egypt, Algeria, Groundwater quality.

The dangers of electrochemical corrosion in well bores are dealth with. Steel components partially immersed in well waters are shown to be, in fact, assemblies of wet chemical batteries. Electrical currents flow from anodic to cathodic areas on the metal surfaces, and anodes dissolve at rates determined by strength of electrical potentials, electrical conductivity of the water and nature of depolarization processes. Examples of well corrosion in developing countries are given. Wells can be seriously affected by corrosion even when their components are not heavily damaged. Encrustation is also a problem. Wells in Pakistan planned for 20-year service lost much of their capacity in a year or two because their filter pipes were clogged with mineral crusts. The fact that idle wells were found to encrust more rapidly than pumping wells is evidence that chemical interactions alone can have a potent effect on well performance. (Campbell-NWWA)
W73-05831

DRILLING WITH MUD - SIMPLE TESTS SAVE TIME AND MONEY,
NL Industries, Inc., Houston, Tex. Baroid Div.
G. R. Gray.
Water Well Journal, Vol. 26, No. 3, p 33-35, March, 1972.

Descriptors: Drilling, Rotary drilling, *Water wells, *Drilling fluids, Bentonite, Gels, Viscosity, Density, Testing, *Testing procedures, Filtration, Suspended solids.
Identifiers: Filter cake, Mud properties, Formation damge.

The purposes in using drilling mud in water well drilling are 1) make hole, 2) keep the hole open, 3) produce water from it. Based on the experience of the driller, three simple tests can be made to determine how effectively the mud will perform its functions. These tests are: 1) density, or mud weight, 2) viscosity, or flow properties, and 3) filtration, or wall building. The significance of each test is discussed briefly. Mud weight is shown to be a measure of suspended solids. The driller is warned that solids which do not contribute useful properties are objectionable, and can cause wear on machinery, retarded drilling rate, and formation damage. Viscosity is the sum of three factors in the fluid: 1) the viscosity of the liquid phase, 2) the size, shape, and number of suspended particles, and 3) the forces existing between the particles and between the particles and the liquid. Advantages and disadvantages of low and high viscosity muds are discussed, as well as the property of gel development. The ability of the solid components of the mud to form a thin filter cake of low permeability on a porous formation is both an advantage and a disadvantage. The presence of the cake prevents fluid loss and stabilizes the borehole wall, but can prevent entry of water when the well is completed. (Campbell-NWWA)
W73-05832

HIGH PRESSURE JET DRILLING,
Esso Production Research Co., Linden, N.J.
W. C. Maurer, J. K. Heilhecker, and W. W. Love.
Preprint Paper Number SPE-3398, American Institute of Mining, Metallurgical, and Petroleum Engineers, Inc., 1972. 15 p, 25 fig, 5 tab, 13 ref.

Descriptors: Drilling, *Jets, Drilling fluids, *Erosion, Sandstones, Limestones, *Drilling equipment, Drill holes, Nozzles, Rates, Penetration, *High pressure, Hydraulic machinery, Rock excavation.
Identifiers: Drill bits.

Initial tests of high pressure drilling were conducted using a cannon to fire 0.2 to 1.0 inch diameter water jets at rocks at pressures up to 25,000 psi. The jets drilled 0.8 to 4.0 inch diameter holes (1 to 3 inches deep) in 0.02 to 0.2 second. A 2-inch diameter laboratory jet drill operating at pressures up to 13,500 psi drilled Carthage marble at 180 ft/hr, Indiana limestone at 280 ft/hr and Berea sandstone at 300 ft/hr. Full-scale field tests have been conducted using high-pressure bits (7-7/8 to 9-7/8 inch diameter) at pressures of 10,000 to 15,000 psi. From 2,500 to 3,500 hydraulic horsepower was required to provide adequate flow rate and annular velocity to lift the cuttings while drilling at high pressure. High-pressure jet bits were used to drill over 13,000 feet of hole during the field test program. When operating at pressures of 10,000 to 15,000 psi, the bits drilled 2 to 3 times faster than conventional bits. In one test, high-pressure bits drilled from a depth of 2,300 to 6,000 feet at an average rate of 152 ft/hr compared to 55 ft/hr for conventional bits in an offset well. (Smith-NWWA)
W73-05833

8H. Rapid Excavation

EARTHQUAKE RESISTANCE OF EARTH AND ROCK-FILL DAMS: REPORT 3--FEASIBILITY OF SIMULATING EARTHQUAKE EFFECTS ON EARTH AND ROCK-FILL DAMS USING UNDERGROUND NUCLEAR EVENTS.
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 08D.
W73-05789

8I. Fisheries Engineering

PRELIMINARY EXPERIMENTS ON THE GROWTH OF TILAPIA AUREA, STEINDACHNER (PISCES, CICHLIDAE) IN SEA-WATER PONDS,
Fish Culture Research Station, Dor (Israel).
J. Chervinski, and A. Yashouv.
Bamidgeh. Vol 23, No 4, p 125-129. 1971.
Identifiers: Cichlidae, Growth, *Mullet, Pisces, Ponds, Salinity, *Tilapia-aurea.

T. aurea is a freshwater species. Two seawater ponds near the Mediterranean shore were stocked with this species. The salinities of the ponds ranged from 36.57% to 44.61%, and hence they were more saline than sea water. In the ponds the fish were fed artificially. Mullet and 3 spp. of marine fish from the vicinity were grown in the ponds at the same time as the tilapias. Growth of the tilapias was equivalent to that reported for the same species in freshwater in Israel. The gonadal index of the females suggested that spawning could have occurred, but no observations of spawning were made.--Copyright 1972, Biological Abstracts, Inc.
W73-05405

FILTRATION EFFICIENCIES OF BOOTHBAY DEPRESSOR TRAWLS,
National Marine Fisheries Service, West Boothbay Harbor, Maine. Boothbay Harbor Lab.
J. J. Graham.
U S Natl Mar Fish Serv Fish Bull. Vol 70, No 2, p 518-520. 1972. Illus.
Identifiers: Boothbay (Maine), *Filtration, Fishery management, *Trawls.

Construction features of this fishery tool are examined to determine whether they affect the filtration of water through the trawls.--Copyright 1972, Biological Abstracts, Inc.
W73-05408

EFFECT OF ENCROACHMENT OF WANAPUM DAM RESERVOIR ON FISH PASSAGE OVER ROCK ISLAND DAM, COLUMBIA RIVER,
National Marine Fisheries Service, Seattle, Wash. Northwest Fisheries Center.
R. L. Major, and G. J. Paulik.
U S Natl Mar Fish Serv Fish Bull. Vol 70, No 1, p 125-140. 1972. Illus.
Identifiers: *Columbia River, Dams, *Fish passages, Oncorhynchus-Nerka, Oncorhynchus-Tshawytscha, Reservoirs, Washington.

The filling of Wanapum Reservoir in 1964 flooded the lower sections of the 3 fish ladders at Rock Island Dam, 61 km upstream from Wanapum Dam on the Columbia River. To maintain fish passage under the new hydraulic conditions, the lower portions of the center and left-bank fish ladders of Rock Island Dam were rebuilt and a new sequence of spill patterns inaugurated. The effectiveness of these modifications was evaluated by comparing results from a series of tagging experiments conducted in 1964-1965 on spring chinook salmon (Oncorhynchus tshawytscha) and sockeye salmon (O. nerka) with the results of similar experiments in 1954-55 before Wanapum Dam was built. These comparisons indicated fish passage over Rock Island Dam had improved substantially between 1954-55 and 1964-65; tagged fish traveled over the dam in a shorter time, and higher percentages of the tagged groups were sighted passing over the dam under postencroachment conditions.--Copyright 1972, Biological Abstracts, Inc.
W73-05412

A MODEL FOR OPTIMAL SALMON MANAGEMENT,
Washington Univ., Seattle. Fisheries Research Inst.
D. E. Booth.
U S Natl Mar Fish Serv Fish Bull. Vol 70, No 2, p 497-506. 1972. Illus.
Identifiers: *Fish management, Model studies, *Salmon, Spawning, Stocks.

Considerable attention has been given in the literature recently to continuous time dynamic maximizing models for fisheries in general, but the time discreteness and interdependency problems encountered in the case of most salmon fisheries have been largely ignored. Hence, a discrete time profit maximizing model for a salmon fishery is developed, and it is shown that a correct salmon management policy takes the form of an investment decision with respect to the level of escapement and that a management policy of maximum sustained yield may be incorrect from an economic standpoint. It is hoped that continued research including construction of a working model will provide some indication of the difference between the magnitude of spawner stocks selected on the basis of maximum sustained yield and stocks selected on the basis of economic optimality.--Copyright 1972, Biological Abstracts, Inc.
W73-05434

PHYSIOLOGICAL BASIS OF ESTABLISHING A DIET FOR DOMESTIC CARP UNDERYEARLINGS (IN RUSSIAN),
R. I. Mukhina.
Sb Nauchno-Issled Rab Vses Nauchno-Issled Inst Prudovogo Rybn Khoz. 2. p 146-152. 1969.
Identifiers: *Amino-acids, *Carp, Diet, Physiological studies, Underyearlings.

About 1/2 of the nutritional energy assimilated by a given year's brood of carp is used in metabolism. Energy expenditure makes up 20-40% of the total nutritional energy used during the whole period of rearing. Unused energy makes up 16-26%. Energy expenditure is maximum in fish raised on a natural food base. The energy utilization in fry is greater than in young during autumn. The contents of 6 basic amino acids: tyrosine, arginine, histidine,

cystine, methionine and tryptophane, in particular the last 2, were higher in natural food than in artificial food. The increase in fish productivity in fertilized ponds is achieved by better supplying of the fish with irreplaceable amino acids. The amino acid composition of a brood's diet must approximate that of their bodies.--Copyright 1972, Biological Abstracts, Inc.
W73-05437

SELECTION OF SPAWNING SITES BY SOCKEYE SALMON IN SMALL STREAMS,
National Marine Fisheries Service, Auke Bay, Alaska. Auke Bay Fisheries Lab.
D. T. Hoopes.
U S Natl Mar Fish Serv Fish Bull. Vol 70, No 2, p 447-458. 1972. Illus.
Identifiers: Oncorhynchus nerka, Salmon, *Sockeye salmon, *Spawning sites, Streams.

This study was undertaken in three small western Alaska streams to identify factors that influence selection of spawning sites by sockeye salmon (Oncorhynchus nerka). Temporal and spatial distribution patterns were relatively constant from year to year despite large fluctuations in the number of spawners. The selection of a spawning site was more closely related to composition of the stream bottom than to gradient, water depth and velocity, or cover.--Copyright 1972, Biological Abstracts, Inc.
W73-05500

RELATIONSHIP BETWEEN SUMMER FOOD OF JUVENILE SOCKEYE SALMON, ONCORHYNCHUS NERKA, AND THE STANDING STOCK OF ZOOPLANKTON IN ILIAMNA LAKE, ALASKA,
International Pacific Halibut Commission, Seattle, Wash.
H. Hoag.
U S. Natl Mar Fish Serv Fish Bull. Vol 70, No 2, p 355-362. 1972. Illus.
Identifiers: *Alaska, Bosmina, Cyclops, *Iliamna Lake, Juveniles, Lakes, Oncorhynchus-nerka, Plankton, Salmon, *Sockeye salmon, Summer, *Zooplankton.

The foregut contents of juvenile sockeye salmon in samples taken at night by tow net in the limnetic area of Iliamna Lake consisted primarily of zooplankton and rarely of insects. The number of organisms per foregut was correlated with the estimated zooplankton density between 0 and 100 m. Cyclops and Bosmina were the dominant zooplankters in both foregut and zooplankton samples. The zooplankton hauls contained a greater percentage of calanoid copepods than the fish foreguts. Food selectivity was indicated but appeared to be minimal. Fry (age 0) foreguts contained a lesser percentage of Cyclops and a greater percentage of Bosmina than did yearling (age 1) foreguts.--Copyright 1972, Biological Abstracts, Inc.
W73-05501

SEX RATIO IN SPAWNING SHOALS OF PERCA FLUVIATILIS LINNAEUS, 1758 AND ROACH-RUTILUS RUTILUS (LINNAEUS, 1758) IN THE KLICAVA VALLEY WATER RESERVOIR WITH REGARD TO THEIR ABUNDANCE (IN CZECH),
K. Pivnicka.
Vestn Cesk Spol Zool. Vol 36, No 1, p 47-53. 1972. Illus.
Identifiers: *Czechoslovakia, Klicavo, Perca-Fluviatilis, *Perch, Reservoirs, *Roach, Rutilus-Rutilus, Sex ratio, Shoals, Spawning.

From 5-yr observations of the sex ratio in spawning shoals of perch and roach during the 1967-71 period it follows that this ratio is influenced, above all, by the age composition as well as by the population number of the said species, the latter being connected with the former. With younger and more abundant spawning population, the greater percentage of males it comprises and vice versa. However, in a very abundant population, even in older classes, the number of females taking part in spawning decreases owing to deteriorating food conditions (omission of spawning).--Copyright 1972, Biological Abstracts, Inc.
W73-05524

PISCICULTURAL USE OF BRACKISH POND BREEDING (IN RUSSIAN),
A. K. Chizhik.
Rybn Khoz Resp Mezhved Temat Nauchn Sb. 12. p 10-15. 1971.
Identifiers: Brackish ponds, *Breeding, *Carp, *Mullet, Pisciculture, Ponds, Ukraine, USSR.

Large pond establishments have been created in southern Ukraine in the irrigated agricultural zone which are characterized by increased mineralization of the water. The range of chemical composition of the salts and degree of general mineralization of the water causes the formation of biological complexes. Fish breeding in bodies of water with increased mineralization presents substantial difficulties. Studies show that a complex of common pond fish including various kinds of carp can be bred in ponds in which the salinity does not exceed 7-8%. For bodies of water in which the salinity exceeds 10-12% use of the biotechniques of marine fish husbandry is necessary.--Copyright 1972, Biological Abstracts, Inc.
W73-05638

REARING OF MULLET IN PONDS OF PRISIVASHE (IN RUSSIAN),
V. A. Fin'ko.
Rybn Khoz Resp Mezhved Temat Nauchn Sb. 12. p 56-59. 1971.
Identifiers: *Mullet, Ponds, Prisivashe, Productivity, *Rearing, Seasonal, Stocking, USSR.

Mullet juveniles for stocking ponds were caught with tuck-nets in the Donuzlav Gulf in May, June, and Sept., in the Skadovsk and Khorla Harbors, with small trawlers in Nov. through Jan. The wintering of grey and striped mullet took place in ponds where 1 side of which entered water from artesian wells with a constant temperature of 13-15 degrees. One end of the canal was joined to a fishing pond where the mullet entered during the thawing period. The yield of mullet over the winter was 70-80%. They were raised in ponds with and without drainage with an area of 0.3 to 280 ha. The mineralization of the water varied from 3.5 to 12.8%. In the autumn grey mullet yearlings weighed up to 170 g, 2 yearlings 350 g, striped mullet yearlings 700 g, 2 yearlings 1770 g and golden grey mullet yearlings 75 g. Mullet productivity was 1-200 kg/ha. The yield of mullet was 27-50% of that stocked during winter.--Copyright 1972, Biological Abstracts, Inc.
W73-05648

CONTRIBUTIONS TO THE STUDY OF THE BIOLOGY OF THE TENCH TINCA TINCA (L.) (PISCES, CYPRINIDAE) FROM THE DANUBE DELTA,
Bucharest Univ. (Rumania).
M. Papadopol, and M. Weinberger.
An Univ Bucur Biol Anim. 20. p 41-49. 1971. Illus.
Identifiers: Cyprinidae, *Danube delta, Pisces, Romania, Sexual maturity, Tench, *Tinca-Tinca.

A total of 184 fish of various ages and sizes were studied. T. tinca from the Danube delta is characterized by early sexual maturity. It occurs in both sexes at about 3 yr when the individuals have an average length of about 22-24 cm and an average weight of 200 g. This species also shows high relative and absolute reproductive potential. Ovogenesis is asynchronous and egg laying is staggered. T. tinca specimens from the Danube delta area show a more rapid growth rate than specimens from other European waters.--Copyright 1972, Biological Abstracts, Inc.
W73-05665

SCIENCE, TECHNOLOGY, AND DEVELOPMENT, VOLUME III, AGRICULTURE.
For primary bibliographic entry see Field 06B.
W73-05750

DEVELOPMENT OF MODERN FISHERIES: EXPERIENCE IN THE UNITED STATES,
Bureau of Sport Fisheries and Wildlife, Highlands, N.J. Sandy Hook Marine Lab.
For primary bibliographic entry see Field 06B.
W73-05752

IMPROVEMENT OF PRODUCTION AND PRESERVATION METHODS IN AN UNDERDEVELOPED FISHERY THROUGH UPGRADING FISHING VESSELS, GEAR AND SANITARY PROCEDURES,
Bureau of Commercial Fisheries, Washington, D.C.
For primary bibliographic entry see Field 06B.
W73-05753

SOME LIFE HISTORY CHARACTERISTICS OF COHO SALMON OF THE KARLUK RIVER SYSTEM, KODIAK ISLAND, ALASKA,
National Marine Fisheries Service, Auke Bay, Alaska. Auke Bay Fisheries Lab.
B. Drucker.
Available from the National Technical Informaton Service as COM-72-50251-01, $0.95 in microfiche.
U. S. Natl Mar Fish Serv Fish Bull. vol 70, No 1, p 79-94. 1972. Illus.
Identifiers: Age, *Alaska, *Coho salmon, Fecundity, Karluk river, Kodiak Island, Mortality, Oncorhynchus-Kisutch, River, Salmon.

Data are presented on some life history characteristics of the coho salmon of the Karluk River system, Kodiak Island, Alaska: age, fecundity, length, and egg size of adults; and migration characteristics, age, and size of smolts. The greater age at maturity of Karluk coho salmon (4 and 5 yr.) because of the longer freshwater residence of the juveniles is unique among reported North American stocks and may result in greater freshwater mortality but less marine mortality because the smolts are larger when they enter the ocean. Fecundity of Karluk coho salmon also differs from that reported for other North American stocks in that they are extremely fecund-more similar to Asiatic stocks of the Kamchatka Peninsula.--Copyright 1972, Biological Abstracts, Inc.
W73-05827

10. SCIENTIFIC AND TECHNICAL INFORMATION

10A. Acquisition And Processing

NATION'S WATER RESOURCES, (VODNOYE BOGATSTVO STRANY).

Pravda, p 6, December 7, 1972. Moscow.

Descriptors: *Publications, *Water resources, Water resources development, Water pollution control, Water utilization.
Identifiers: *USSR.

The first issue of the USSR Academy of Sciences' magazine 'Vodnyye resursy' (Water Resources) has been published. It will appear once every two months, and each issue will be 18 press sheets in size. Asked to comment on the new publication,

Doctor of Technical Sciences A.N. Voznesenskiy, Director of the USSR Academy of Sciences' Institute of Water Problems and editor-in-chief of the magazine, noted that the new journal will deal primarily with protection of waters from pollution and with utilization and long-range estimates of the country's water resources. Upcoming issues will include articles by Ye. Ye. Alekseyevskiy, USSR Minister of Land Improvement and Water Resources, on ways to utilize water resources effectively; P.S. Neporozhnyy, USSR Minister of Power and Electrification, on hydroelectric power in water-management studies; Academicians S.V. Kalesnik and T.S. Khachaturov; corresponding members of the USSR Academy of Sciences; and others. (Josefson-USGS)
W73-05672

10C. Secondary Publication And Distribution

BIBLIOGRAPHY OF THE 160-ACRE ANTIMONOPOLY WATER LAW,
Senate, Washington, D.C.
For primary bibliographic entry see Field 06E.
W73-05233

A SELECTED AND ANNOTATED BIBLIOGRAPHY OF UNDERSTORY-OVERSTORY VEGETATION RELATIONSHIPS,
Arizona Univ., Tucson. Dept. of Watershed Management.
For primary bibliographic entry see Field 04A.
W73-05770

A SELECT BIBLIOGRAPHY ON POLLUTION OF ESTUARIES AND COASTAL WATERS WITH PARTICULAR REGARD TO INDUSTRIAL EFFLUENTS,
British Iron and Steel Research Association, London (England). Strip Mills Div.
For primary bibliographic entry see Field 05B.
W73-05805

BIBLIOGRAPHY OF GROUNDWATER STUDIES IN NEW MEXICO.
For primary bibliographic entry see Field 02F.
W73-05819

10F. Preparation of Reviews

UNDERGROUND COAL MINING METHODS TO ABATE WATER POLLUTION: A STATE OF THE ART LITERATURE REVIEW.
West Virginia Univ., Morgantown. Coal Research Bureau.
For primary bibliographic entry see Field 05B.
W73-05215

NONPOINT RURAL SOURCES OF WATER POLLUTION,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 05B.
W73-05334

AN EVALUATION OF METHODS FOR DETECTING MERCURY IN SOME U.S. COALS,
Bureau of Mines, Pittsburgh, Pa. Pittsburgh Energy Research Center.
For primary bibliographic entry see Field 05A.
W73-05409

NON-FLAME METHODS FOR MERCURY DETERMINATION BY ATOMIC ABSORPTION--A REVIEW,
Perkin-Elmer Corp., Norwalk, Conn.
For primary bibliographic entry see Field 05A.
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For primary bibliographic entry see Field 05D.
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THE NEUTRON METHOD FOR MEASURING SOIL MOISTURE CONTENT--A REVIEW,
Hull Univ. (England). Dept. of Geography.
For primary bibliographic entry see Field 02G.
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RECENT APPLICATIONS OF MASS SPECTROMETRY AND COMBINED GAS CHROMATOGRAPHY-MASS SPECTROMETRY TO PESTICIDE RESIDUE ANALYSIS,
Food and Drug Administration, Perrine, Fla. Div. of Pesticides.
For primary bibliographic entry see Field 05A.
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Science, Technology, and Development, Volume III, Agriculture.
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Colorado State University, Irrigation Return Flow Quality	W73-05352 – 05353 05720 – 05736 05739	20
Cornell University, Policy Models for Water Resources Systems	W73-05808 – 05815 05817	9
National Water Well Association, Water Well Construction Technology	W73-05819 – 05826 05828 – 05833	14
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University of Texas, Wastewater Treatment and Management	W73-05212 – 05218 05619 – 05628 05630 – 05637 05639 – 05647 05649 05651 – 05654 05656 – 05664	48
University of Wisconsin, Eutrophication	W73-05354 05356 – 05358 05360 – 05363 05365 – 05374 05380	19
University of Wisconsin, Water Resources Economics	W73-05740 – 05741 05743 – 05746 05748 05750 – 05762	20

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Vanderbilt University, Metals Pollution	W73-05390 -- 05398 05400 -- 05401 05403 -- 05404 05407 05409 -- 05410 05413	17
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* U. S. GOVERNMENT PRINTING OFFICE : 1973 O - 511-051 (19)

CENTERS OF COMPETENCE AND THEIR SUBJECT COVERAGE

- Ground and surface water hydrology at the Water Resources Division of the U.S. Geological Survey, U.S. Department of the Interior.
- Metropolitan water resources planning and management at the Center for Urban and Regional Studies of University of North Carolina.
- Eastern United States water law at the College of Law of the University of Florida.
- Policy models of water resources systems at the Department of Water Resources Engineering of Cornell University.
- Water resources economics at the Water Resources Center of the University of Wisconsin.
- Design and construction of hydraulic structures; weather modification; and evaporation control at the Bureau of Reclamation, Denver, Colorado.
- Eutrophication at the Water Resources Center of the University of Wisconsin, jointly sponsored by the Soap and Detergent Association and the Agricultural Research Service.
- Water resources of arid lands at the Office of Arid Lands Studies of the University of Arizona.
- Water well construction technology at the National Water Well Association.
- Water-related aspects of nuclear radiation and safety at the Oak Ridge National Laboratory.
- Public water supply treatment technology at the American Water Works Association.

Supported by the Environmental Protection Agency in cooperation with WRSIC

- Thermal pollution at the Department of Sanitary and Water Resources Engineering of Vanderbilt University.
- Water quality requirements for freshwater and marine organisms at the College of Fisheries of the University of Washington.
- Wastewater treatment and management at the Center for Research in Water Resources of the University of Texas.
- Methods for chemical and biological identification and measurement of pollutants at the Analytical Quality Control Laboratory of the Environmental Protection Agency.
- Coastal pollution at the Oceanic Research Institute.
- Water treatment plant waste pollution control at American Water Works Association.
- Effect on water quality of irrigation return flows at the Department of Agricultural Engineering of Colorado State University.

Subject Fields

1 NATURE OF WATER

2 WATER CYCLE

3 WATER SUPPLY AUGMENTATION AND CONSERVATION

4 WATER QUANTITY MANAGEMENT AND CONTROL

5 WATER QUALITY MANAGEMENT AND PROTECTION

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